

DEPARTMENT OF THE INTERIOR

---

ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEYS  
BRANCH

1914-15

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OTTAWA

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REPORT  
OF THE  
SURVEYOR GENERAL OF DOMINION LANDS  
1914-15

DEPARTMENT OF THE INTERIOR,

TOPOGRAPHICAL SURVEYS BRANCH,

OTTAWA, August 9, 1915.

The Deputy Minister of the Interior,  
Ottawa.

I have the honour to submit the following report of the Topographical Surveys Branch for the year ended March 31, 1915.

The progress during the past year and the general extent of the surveys at its close are illustrated by maps which accompany the report in monograph form.

In the parliamentary appropriations for the fiscal year 1914-15 provision was made for the continuance of Dominion land surveys on practically the same scale as for the previous year; the total appropriation for this purpose being \$1,047,000.

BLOCK OUTLINES.

During 1913 the tide of settlement set in strongly towards Peace River district. Extending northerly from this, Peace and Athabaska rivers afford two natural highways for the progress of future settlement. This northerly country is to a large extent unknown and unexplored. Reports so far received indicate that it is mostly wooded, but that extensive swamps occur frequently, with here and there tracts of good agricultural land. Much of the land is unsuitable for settlement, but it is impossible to foresee where future settlement will take place. In order that the department may be in a position to proceed with subdivision surveys wherever required, the system of base lines and initial meridians has been extended into the unexplored districts. As these lines form the basis for all surveys which follow, they must be established with the greatest care and accuracy. Although the surveys are carried on remote from settlement, and practically no means of communication exist with civilization, the work is carried on with great precision. The surveyor is furnished with first-class equipment in instruments, and no surveys excepting those made in geodetic work are carried out with greater refinement. Good results are being obtained, and are largely due to the attention which the surveyors devote to the many smaller, yet not unimportant, details of the work. A party of twenty-three men in charge of a Dominion land surveyor is employed on each base line or meridian surveyed. In addition to the survey of the actual line the country for a distance of twelve miles on either side is explored; from the explorers' reports, maps are prepared which show the topography of the district, the kind and quality of the timber, and the nature of the soil. Simultaneously with the surveys of the block outlines, levels of the lines are taken; these form parts of a great network of levels which is being extended over the entire country.

Four parties were employed during the year on the survey of block outlines in northern Alberta. The 29th base line (between townships 112 and 113) was surveyed



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from the Fifth to the Sixth meridian, a distance of 140 miles. This line passes about twenty-five miles north of Fort Vermilion, where it crosses the summit of Caribou mountains. These are lightly wooded with stunted spruce, and the surface is covered with deep moss, underneath which the ground remains frozen from year to year. Bears and caribou are plentiful, and fish abound in several small lakes. The surrounding country is gently rolling and covered with small spruce and poplar. The soil is good and grass plentiful.

The 26th base line (between townships 100 and 101) was established easterly from Peace river to the Fifth meridian, and the 27th was continued easterly from range 8 to the meridian. When cleared, most of this district will make splendid farming land, but at present it is covered with windfall and *brulé*. The land being generally level, extensive drainage will be necessary to drain the swamps and make the country accessible. A third party projected the survey of the 26th base (between townships 100 and 101) from the Fourth to the Fifth meridian, approximately 150 miles. This line is situated about forty miles north of McMurray, and crosses Birch mountains about fifteen miles west of Athabaska river. Between the river and the mountains the soil is good, and in places the timber is excellent. West of the mountains a surface of moss covers a mass of boulders embedded in clay.

The survey of the 24th base (between townships 92 and 93) and the 25th base (between townships 96 and 97) were continued westerly from Athabaska river to the Fifth meridian. A large portion of the district west of Athabaska river is occupied by Birch mountains, an extensive elevated plateau covered with boulders. The surface has been burned over and is now covered with windfall and scrub. Several extensive muskegs were met with. Legend lake, about nine miles long and three miles wide, contains an abundant supply of fish. It is so named because of a superstition held by the Indians that the lake is the abode of monsters.

To prepare for settlement along the line of the Hudson Bay railway, which, to a limited extent, is expected to follow the construction of this line, three parties were occupied in pushing forward the system of block outline surveys in northern Manitoba.

The Principal meridian was continued northerly from township 80 to township 88 through a formerly unknown country. The surface, though gently rolling, is a series of muskegs, mossy sloughs, and floating bogs, covered with windfall and second-growth spruce and tamarack. Drainage, which must precede settlement, is comparatively easy owing to the numerous creeks and rivers.

The same party retraced the Second meridian from township 56 to township 85. This retracement was necessary to determine the correct bearings and chainages for the line, as many of the records of the original survey had been destroyed by a fire in the survey camp shortly before the close of field operations.

The two remaining parties surveyed short portions of base lines and meridians in the vicinity of the right of way from Split lake northeasterly to Port Nelson. This district is mostly level with intersecting ridges, the surface being largely muskeg or tamarack swamps drained in part by Nelson river. The soil is a deep clay loam overlaid with moss; it will not be suitable for agriculture until the moss has been removed. The timber, which is sparse, consists mostly of burned spruce and bluffs of green poplar. Port Nelson is the proposed terminus of the Hudson Bay railway. At the time of the survey, five hundred men were employed on the construction of the harbour there.

To prepare for this subdivision in the near future, of the lands adjacent to the easterly shore of lake Winnipeg, a party was sent to establish short portions of the base lines in that vicinity. About one hundred miles of line were surveyed. Forest fires were prevalent and destroyed large areas of timber. The land near the lake is generally level, the surface being a succession of swamps, muskegs, and low rock



## SESSIONAL PAPER No. 25b

ridges. The muskegs are not deep, and the bottom is generally clay with more or less muck, but owing to the difficulty of drainage it is doubtful if this district will be settled in the near future. Silver and black foxes are plentiful.

## TOWNSHIP SUBDIVISION.

As township subdivision is well in advance of settlement, surveys of this nature were considerably curtailed during 1914. Eighteen parties only were employed on subdivision at contract rates, whereas twenty-seven parties were employed on similar surveys the previous year. Eleven of the parties worked in the Peace River district west of Lesser Slave lake, where settlement was proceeding rapidly. In all the townships subdivided the soil is good and well suited for agriculture.

A few townships were subdivided by a party under contract around Wabiskaw lake, where several settlers had already located. This district will rapidly fill up when railway facilities are provided.

Subdivision of the lands adjacent to Athabaska river was continued, and these lands are now open for settlement as far north as township 94 or about thirty miles north of McMurray.

A few townships were surveyed in Manitoba to open up the lands ahead of settlement north of lake St. Martin and in the vicinity of Washow bay. One party was employed at each place.

Subdivision surveys being well ahead of settlement in Saskatchewan, no contract surveys were allotted in that province.

In addition to the eighteen parties employed under contract, fourteen parties were employed under daily pay for subdivision surveys which were of such a nature that they could not conveniently be executed under contract at the regular rates fixed by Order in Council. The principal surveys of this nature made during the year were at or near the following places: Fort Vermilion, in northern Alberta; Fort St. John and Hudson Hope, in the Peace River block; Peace River Crossing; Rocky Mountain House; Atikamek lake, north of Lesser Slave lake; along the Hudson Bay railway, and in the Railway Belt, British Columbia.

Surveys along the Hudson Bay railway now extend as far north as township 70, range 5, west of the Principal meridian.

Most of the surveys in the Railway Belt were undertaken at the request of the Dominion Lands agents. In addition to regular township subdivision, the survey parties in British Columbia make all necessary surveys of mineral claims and town and village sites: they also retrace the boundaries of previously surveyed Indian reserves and provincial lots. In districts where the land is most valuable the department disposes of it in parcels of forty acres or less. As the regular township subdivision in these cases is not sufficient to enable the owners to determine the boundaries of their holdings, an effort is made to survey two or more boundaries of each parcel and to mark at least two corners on the ground.

I regret to report that while engaged on surveys along the bank of Nahatlatch river, Mr. A. E. Hunter, D.L.S., lost his balance on a high precipice overlooking the river, and was drowned. His body was recovered several days after and brought to his home in Wiarton, Ontario, for interment.

Subdivision surveys of Dominion lands at the present time are much more elaborate than formerly: consequently the rates per mile for surveys under contract are considerably higher. To ascertain how subdivision surveys executed by parties under daily pay compare as to cost with similar surveys under contract, a party under daily pay was employed during the season on subdivision surveys under conditions as near as possible to those under which contract work is carried on. The place selected was a block of townships near Athabaska river, about thirty-five miles northeast of Athabaska. Although the surveyor lost part of his equipment by a canoe accident, and in spite of the fact that considerable time was spent in building roads, the cost per mile of his surveys was below the average cost per mile of surveys in the same district made at contract rates.



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It is the intention to introduce a number of improvements in our methods of survey. All section lines in a township will now be surveyed and a few lines of levels run in each township. The survey of all the section lines will enable the settlers in the more or less wooded districts to find their lines with little difficulty, while the levels will be valuable later in the preparation of drainage schemes, highways and for other purposes.

#### INSPECTION OF SURVEYS.

The surveys executed under contract have been carefully inspected to determine if the work had been accurately performed and if the charges for doing the work were in accordance with the terms of the contract. Five inspectors were employed for this purpose, and their reports show that the contractors have done their work carefully and in conformity with the requirements.

When inspectors are not engaged on inspection work they occupy their time as far as possible in the performance of subdivision and miscellaneous surveys. During last season one inspector visited the camps of several surveyors in charge of parties under daily pay. He examined their instrumental equipment and their outfits and reported thereon to the office, as well as on the work performed and the general fitness of the surveyor to have charge of survey parties.

#### INTERPROVINCIAL BOUNDARY SURVEYS.

The delimitation of the boundary between the provinces of Alberta and British Columbia, begun in 1913, was continued last season under the same three commissioners as formerly. Two parties were employed on the survey, one under each of the commissioners appointed by the provinces: one party surveyed the boundary line and erected the boundary monuments; the other made a photo-topographical survey of the country on both sides of the boundary. The representative of the Dominion visited the parties occasionally to keep in touch with the progress of the work and to confer with the other commissioners on questions where difficulties or disputes might arise.

The boundary was established across Crowsnest and North Kootenay passes, and fifty-nine boundary monuments erected. Preliminary survey was commenced at South Kootenay pass.

#### LEVELS.

During the year four thousand five hundred miles of lines of levels were run, making the total mileage of levels up to the present time, nine thousand eight hundred. A publication is now in the hands of the printers giving in tabulated form the information collected by our surveyors for 7,400 miles of the levels already taken. It is expected that this publication will fill a long felt want, as it will contain much information that will prove invaluable in the development of new areas, in the reclamation of swamp lands, in the extension of railway systems, in the development of water areas and in many other public and private undertakings.

#### TOPOGRAPHICAL SURVEYS.

The topographical survey of the portion of Jasper park in the vicinity of Jasper, begun in 1913, was continued. The flats of Athabaska and Miette rivers, and the rolling country behind the flats were surveyed for a distance of approximately five miles on each side of the town. The survey was made by means of the plane table, and from the information collected it will be possible to prepare a contour map of the district with intervals of ten or twenty feet. The map will be most useful in planning improvements and public works for the development of the park. The attractiveness of the place is greatly enhanced by the numerous small lakes scattered over the area surveyed.



## SESSIONAL PAPER No. 25b

The topographical survey of Crowsnest forest reserve made at the request of the Forestry Branch was completed, and the publication of the map of the reserve is now being proceeded with. An area of approximately seven hundred square miles was surveyed, comprising the eastern slope of the Rocky mountains southerly from the Canadian Pacific railway to the international boundary. Large deposits of coal occur within the reserve, but only those near the railway are being worked as yet. An oil-well, bored to a depth of 970 feet, yields from fifteen to eighteen barrels of crude oil a day.

Topographical surveys were considerably retarded by high winds and smoke from forest fires. During a season comprising one hundred and twenty-five days, forty-six days were totally unfit for work, while several others were unfavourable to good results.

## STADIA SURVEYS.

Twelve parties were employed on stadia surveys of water areas in the portions of Saskatchewan and Alberta, which were subdivided many years ago. At the time of the original surveys many bodies of water existed which have now partially or entirely dried up leaving considerably more land available for settlers. In some instances bodies of water are found which did not exist, or were not noticed by the surveyor when subdividing the townships: in other instances the courses of rivers are found to have greatly altered. Each township is carefully examined by a stadia party, and with the information collected we are able to issue new township plans representing conditions as they are at present. During the year, 605 townships were examined, and 2,733 miles of traverse made by the stadia parties alone.

## CORRECTIONS AND RESURVEYS.

In making the subdivision of Dominion lands, wooden posts have been employed to a very large extent. Previous to 1883, iron posts were used to mark township corners only, while from 1883 to 1889 they were also used to mark section corners in prairie, while wooden posts were used in bush. From 1890 to the present all township and section corners have been marked by iron posts. Quarter-section corners were first marked by iron posts about 1908. From this it is evident that up to six or seven years ago wooden posts were very extensively used as monuments.

Although sound wooden posts were invariably chosen, their existence as monuments was of very short duration. They decayed rapidly and were often broken. Again, iron posts are frequently removed by persons, who perhaps do not understand the purpose they serve, or by others who are interested in destroying evidence of the survey. In making improvements, homesteaders often plough over monuments, thus destroying them. The destruction of monuments is an indictable offence punishable by imprisonment. Although a reward of fifty dollars has been offered for evidence of offences, very few convictions have been secured, and the removal of posts and destruction of monuments continue. A form of iron post, which will be much more difficult to remove, is being made at present.

When the survey monuments have disappeared to any considerable extent, new settlers experience much difficulty in determining the limits of their homesteads. Resurvey under the provisions of clause 58 of the Dominion Land Surveys Act are undertaken in townships now being colonized, when investigation shows that such a survey is necessary to determine the boundaries of the various quarter-sections. In townships where a large portion of the land is patented and has passed under provincial jurisdiction, resurveys are not undertaken, as the perpetuation of the monuments, in such cases, is the duty of the owners of the lands.

Surveys of twenty or thirty years ago were not made with the same care and precision as is practised to-day. On examination of those surveys, it is often found that the bearings and chainages are very erroneous, and the area of quarter-sections is



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considerably larger, or smaller, than returned by the surveyor. Owing to these irregularities of survey, it often happens that adjoining homesteads differ in area by as much as fifty or sixty acres, which gives rise to much dissatisfaction among the settlers, and litigation often results. Errors in the survey of settled lands can be corrected only under the authority of section 57 of the Dominion Lands Surveys Act.

The Department of Justice has recently ruled that sections 57 and 58 of this Act are not applicable to lands which passed from the control of the Dominion prior to the date the Act was assented to, viz.: March 17, 1908, unless authorized by the Legislature of the province in which the lands are situated. Acts authorizing these surveys have been passed by the provinces of Alberta and Saskatchewan, but up to the present Manitoba has not done so.

Three parties were employed on the resurvey of townships under the provisions of section 58 of the Dominion Lands Surveys Act. Fourteen townships were either wholly or partly resurveyed. These parties also made surveys of a miscellaneous nature, such as extending subdivision lines over the dried-up beds of lakes, which originally covered large areas. They established monuments to mark various corners made accessible by the partial drying up of lakes.

One surveyor with an assistant only, was employed throughout the season in travelling over the country attending to complaints, correcting errors, erecting monuments and making various adjustments which did not involve much work. Towards the close of the season, when their other surveys had been completed, two other surveyors, each with an assistant, were employed at similar miscellaneous work.

The surveys of base lines and meridians made many years ago, when instruments and methods were not sufficiently accurate, are often found to be quite erroneous. Errors as great as twenty-seven chains in distance and seventeen chains in direction have been discovered. In order to determine the exact location of the monuments existing along such lines, a retracement survey is necessary. This work was commenced in the season of 1912, and has been continued during each successive season.

In 1914, one party was employed on the retracement of the second base line (between townships 4 and 5) between the Second and Fourth meridians, and of the Fourth meridian from the international boundary to township 54. This party retraced over 700 miles.

The council of the city of Prince Albert asked for a resurvey of the river lots in Prince Albert settlement. Where most of the lands affected are private property, the usual answer to requests for resurveys in cases of this kind is that the Dominion Government has no interest in the lands and any resurvey that may be required must be made by the province under the authority of the provincial laws.

The case in question, however, was very exceptional. The survey was made a long time ago and the records were imperfect; there seemed to be justification for the departure from the general rule. The difficulties cited by the city council seemed to be due mostly to the disappearance of the marks of the original survey and to imperfections in the plan of the same. It was considered that the proposed resurvey would remove the difficulties.

Accordingly, one party made a retracement survey of part of the settlement and the surrounding townships. They also resurveyed a township under the provisions of section 58 of the Dominion Lands Survey Act, and subdivided a portion of Sturgeon Lake Indian reserve No. 101, which had been surrendered to this department.

#### LATITUDE OBSERVATIONS.

One party, consisting of a surveyor and one man, observed for latitude on the Fourth meridian near lake Athabaska, at the intersections of Peace river with the Fifth and Sixth meridians, and also on the Sixth meridian near the 23rd base line. For this work the surveyor was supplied with special instrumental equipment including zenith telescope.



## SESSIONAL PAPER No. 25b

## SETTLEMENT AND TOWNSITE SURVEYS.

In 1908, the townsite of Churchill was surveyed and the general scheme for the town plot was laid out. The boundaries of the streets and blocks were established but time did not permit the surveyor to subdivide the blocks into lots that season and to post them properly.

A portion of the townsite having been disposed of, it was necessary to complete the work which had been left unfinished.

The trip from Pas to Churchill required from March 11 to April 13. From Pas the party travelled on the Canadian Northern railway to the end of steel, a distance of about 85 miles, and proceeded along the right-of-way, a distance of 155 miles. During this portion of the trip, horses were used, but from that point five teams of five dogs each were used as a means of transport. From ten to thirty miles were travelled each day, depending on the character of the country and the depth of the snow. High winds delayed progress considerably, and Port Nelson was reached about April 1. From there the party went directly across country to Churchill, the usual custom being to follow the coast line. During this part of the trip, they suffered considerably from frost bites as there was a scarcity of wood for fuel.

The return journey was commenced on August 25, and a few days were spent at Port Nelson attending to matters regarding transportation. The party left that point on September 5, and reached North Sydney, Cape Breton, on September 14.

The townsite is situated on a rock and gravel bed. The country around Churchill is quite barren, but there is considerable spruce and tamarack near Churchill river. Grass grows near the edges of the rivers and lakes. The summer season is very short, commencing August 1, and lasting about six weeks. The spring is cold and wet, snow storms occurring during June.

One party was engaged in surveying settlements along Mackenzie river at Forts Providence, Wrigley, Simpson, Norman and Good Hope, at Hay river and Fort Resolution, which are situated near Great Slave lake, and at Pelican settlement on Athabaska river. Most of the inhabitants of these places are Indians and half-breeds, whose chief occupation is hunting. The party engaged at this work remained in the field from the spring of 1913 to the fall of 1914.

Winter sets in early in the northern country, and Mackenzie river was completely frozen over on November 18. When the ice is forming, drift-ice piles up in huge masses wherever the current is swift, and then becomes frozen solid. This forms an extremely rough surface for dog teams to travel upon. The surveyor had to cut several miles of trail through the ice, often necessitating the making of a road through walls of ice, eight feet high and four feet thick. During the months of January and February, the temperature varied from 30° to 60° below zero, and no surveying was done. During this time the surveyor and assistant were employed at the preparation of returns, while the men secured wood for fuel, which was scarce and had to be brought a considerable distance.

During the summer the climate throughout the north is ideal, and is not liable to sudden changes. The weather is very warm in July and August, but there is sufficient rainfall to keep the ground in excellent condition for the growth of grain and vegetables. The wet season extends from the latter part of August to the middle of September, when frosts occur frequently, and snow falls occasionally at the end of August.

Moose, caribou, and bear are quite plentiful, while mountain sheep and goats roam over the mountain slopes. During the summer season, ducks, geese, ptarmigan, and partridges can be obtained with but little difficulty. Fish in abundance may be had in all bodies of water of any considerable size. Splendid whitefish, trout, pike and many other varieties are very plentiful in Mackenzie river and in Great Bear and Great Slave lakes.



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At all the points visited, all vegetables, excepting tomatoes and melons, are successfully grown. They attain good size and are of splendid quality. Even at Fort Good Hope, on the verge of the Arctic Circle, splendid gardens were seen. Raspberries, cranberries and blueberries grow in abundance throughout the north. Farming is carried on to a small extent at Forts Resolution, Simpson, and Hay River, where wheat and oats have been successfully raised. Barley and oats are grown at Fort Providence, and barley at Fort Norman. A well-equipped saw-mill is located at Fort Resolution, and another at Fort Simpson. These furnish shingles and lumber for the inhabitants. The R.N.W.M. Police have detachments stationed at Forts Resolution and Simpson. Besides preserving order, they assist the fire patrols, and forest fires are now decreasing in number. A large mission school, where Indian and half-breed children are educated, is conducted at Fort Providence. Copper deposits exist in the vicinity of Forts Resolution and Good Hope, and galena has been found near Fort Resolution.

At the request of the Dominion Parks Branch, many surveys of a miscellaneous nature were made in the Yoho and Rocky Mountains parks. One party was engaged on this work throughout the season, and another for a few months. Various road location surveys were made, and levels taken in the vicinity of Banff, Field, and Lake Louise. The Calgary-Banff automobile road was traversed, and levels taken for a distance of twenty-two miles. Cemeteries were laid out at Bankhead and Field; Canmore townsite was re-surveyed. Surveys of the villa-lot section and the townsite at Banff, commenced last season, were also continued. This work was made to conform with designs submitted by Mr. Mawson, town-planning expert.

#### TIMBER BERTHS.

Under the present regulations, timber berths are surveyed by the department before they are offered for sale. The cost of the survey in each case is included in the upset price of the berth. During the season, three berths were surveyed, according to instructions issued from this office, necessitating the establishment of approximately twenty-three miles of timber-berth boundaries. Two of these berths were surveyed by surveyors employed under daily pay. Tenders were received for the survey of the third, and the work was allotted to the surveyor submitting the lowest tender.

#### MINERAL CLAIMS.

Every mineral claim is designated by a lot number in the group to which such lot belongs. The claimant, after staking his claim, is required to apply to the Surveyor General to have instructions issued to a Dominion land surveyor to have the boundaries of the claim run out, measured, and marked on the ground. Lot and group numbers for the claim are furnished with the instructions. After completing the work on the ground, the surveyor must forward to the Surveyor General a plan of the claim on tracing linen, together with complete field notes. He must furnish, as well, the necessary duplicates, the plans for filing with the mining recorder and for posting on the claim.

During the past season, surveys were made of sixty-seven mineral claims, nine being located in the Yukon territory. Returns were also received for eight mineral claims surveyed in 1912, and for thirty-six surveyed in 1913. All of these were located in the Yukon territory, and the survey returns were not completed in time for previous reports.



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YUKON SURVEYS.

Dominion land surveys in the Yukon territory are under the direction of a Director of Surveys who has his office at Dawson; he has a staff of two draughtsmen. During the year, 113 miles of base lines and traverses were surveyed. The work was mostly in connection with mining claims.

STATEMENT OF MILEAGE SURVEYED.

The following is a comparison of the mileage surveyed each year since 1912:—

| Nature of Survey.           | April 1, 1912,<br>to<br>March 31, 1913. | April 1, 1913,<br>to<br>March 31, 1914 | April 1, 1914,<br>to<br>March 31, 1915. |
|-----------------------------|---|--|---|
|                             | Miles.                                  | Miles.                                 | Miles.                                  |
| Township outlines .....     | 2,718                                   | 3,760                                  | 3,270                                   |
| Section lines.....          | 10,365                                  | 7,918                                  | 7,100                                   |
| Traverse.....               | 3,505                                   | 5,748                                  | 5,141                                   |
| Resurvey.....               | 2,586                                   | 1,632                                  | 2,610                                   |
| Total for season.....       | 19,178                                  | 19,058                                 | 18,055                                  |
| Number of parties....       | 72                                      | 66                                     | 59                                      |
| Average miles per party.... | 266                                     | 289                                    | 307                                     |

The following tables show the mileage surveyed by the parties under daily pay, and by the parties under contract:—

WORK OF PARTIES UNDER DAILY PAY.

| Nature of Survey.            | April 1, 1912,<br>to<br>March 31, 1913 | April 1, 1913,<br>to<br>March 31, 1914 | April 1, 1914,<br>to<br>March 31, 1915. |
|------------------------------|--|--|---|
|                              | Miles.                                 | Miles.                                 | Miles.                                  |
| Township outlines .....      | 1,619                                  | 2,074                                  | 2,088                                   |
| Section lines.....           | 1,358                                  | 1,695                                  | 1,756                                   |
| Traverse .....               | 992                                    | 4,179                                  | 3,987                                   |
| Resurvey.....                | 2,538                                  | 1,613                                  | 2,538                                   |
| Total for season.....        | 6,507                                  | 9,561                                  | 10,369                                  |
| Number of parties .....      | 35                                     | 39                                     | 41                                      |
| Average miles per party..... | 186                                    | 245                                    | 255                                     |



WORK OF PARTIES UNDER CONTRACT.

| Nature of Survey.            | April 1, 1912,<br>to<br>March 31, 1913. | April 1, 1913,<br>to<br>March 31, 1914. | April 1, 1914,<br>to<br>March 31, 1915. |
|------------------------------|---|---|---|
|                              | Miles.                                  | Miles.                                  | Miles.                                  |
| Township outlines....        | 1,099                                   | 1,695                                   | 1,514                                   |
| Section lines.....           | 9,077                                   | 6,214                                   | 5,012                                   |
| Traverse.....                | 2,517                                   | 1,569                                   | 1,154                                   |
| Resurvey.....                | 48                                      | 19                                      | 6                                       |
| Total for season.....        | 12,671                                  | 9,497                                   | 7,686                                   |
| Number of parties....        | 37                                      | 27                                      | 18                                      |
| Average miles per party..... | 342                                     | 352                                     | 427                                     |

Owing to the nature of their work, twelve parties are not included in the statement of mileage for the year ended March 31, 1915.

COST OF SURVEYS.

The following statement shows the average cost per mile of surveys executed by surveyors under daily pay, and by surveyors under contract:—

|                                  | Surveyed under<br>daily pay. | Survey under<br>contract. |
|----------------------------------|------------------------------|---------------------------|
| Total mileage surveyed . . . . . | 10,369                       | 7,686                     |
| Total cost . . . . .             | \$704,950 00                 | \$229,303 00              |
| Average cost per mile.....       | 48 70                        | 29 83                     |

CORRESPONDENCE.

The correspondence consisted of: letters received, 14,067; letters sent, 17,502.

ACCOUNTS.

Number of accounts dealt with, 1,710; amount of accounts, \$1,046,910; number of cheques forwarded, 3,450.

OFFICE WORK.

(T. Shanks, Assistant Surveyor General.)

For some years the organization of an efficient office staff has been seriously interfered with owing to the frequent changes in the personnel of our technical officers. It was felt that this was largely due to the activity in general surveying and engineering work, which provided employment with better remuneration and brighter prospects for men who were qualified by special training in technical schools or by experience in practical work. When conditions changed in the business world, it was expected that the office staff would tend to become more permanent in nature. This



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may be the result eventually, but up to the present the improvement has not been noticeable. During the past year fourteen clerks have severed their connection with our office. Three left to resume their studies at the university, four preferred field work to office work, one accepted a more attractive position elsewhere, and six were transferred to other branches or departments of the service. Fourteen men were selected by the Civil Service Commission to replace them but, while possessing the necessary educational qualifications, the new men lack the training and experience of the clerks who have gone.

To add to the difficulties caused by the unsettled condition of the staff, the office has suffered the temporary loss of twelve clerks who have enlisted for active service in the European war. Nine of these went with the first contingent and three with expeditionary forces that were recruited later. Additional recruiting will undoubtedly lead to the temporary loss of others willing to respond to the call of duty.

There has been no relaxation in the prosecution of our field work during the past year. For some time, when the flood of immigration was at its highest, there was some difficulty in carrying on field operations so as to keep ahead of the rapid development in western Canada. A sufficient number of properly qualified surveyors could not be obtained as the remuneration offered in other branches of engineering was more attractive. At present, with the exception of a few localities, the surveyors are well ahead of settlement and it is no longer difficult to obtain efficient technical assistance in carrying out our field work.

The completion of township subdivision in those districts where it had been urgently required owing to the demands of settlement, enabled the department to devote some attention to several branches of the field work which had been neglected owing to the pressure of other work. Among the divisions of the work now receiving greater attention are resurveys, stadia surveys of water areas, the securing of magnetic and astronomical data, and the taking of levels.

The resurveys are chiefly for the purpose of re-establishing corners where the original monuments have disappeared and for the correction of errors in the old surveys. These resurveys increase in difficulty with the advance in settlement. The aim of the department is to assist the homesteaders to find their true corners, but in some cases the owners of adjoining lands object to the resurvey and an awkward situation results. In other cases municipal or private improvements may have been made which would be affected by the re-establishment of the corners in correct position.

Stadia surveys of water areas have been rendered necessary by the great changes in these topographical features since the original surveys were made. In many cases areas shown on the old maps as lakes are now being subdivided into homesteads. In other cases the opposite change has taken place, and lakes which have all the appearance of being permanent are in existence over areas which were once shown as dry land. Frequently an additional reason exists for these surveys owing to the unsatisfactory nature of the water boundaries for the purpose of accurately defining the land to be granted. This difficulty does not arise where the bank is a permanent feature, but where it is subject to change it has been found advisable to substitute straight lines whose positions can be definitely located.

The work of levelling and the collection of magnetic and astronomical data can be done by our field parties at very little extra expense while carrying on the ordinary land surveys, and afford a means of securing much information of great value both from a practical and a purely scientific standpoint.

The change in the general nature of the field work and the wider scope of the investigations carried out by our survey parties have resulted in a corresponding change in the character and amount of the office work. In the earlier days of the branch the surveyors were employed principally in the subdivision of townships into sections. The office work in preparing instructions and examining survey returns was comparatively simple. The varied nature of the present surveys and the complicated



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problems to which they give rise have created a greater need for a competent and permanent staff familiar with all the intricacies of our work.

The miscellaneous or routine business of the office continues to increase. This covers such points as inquiries about the nature and capabilities of the districts surveyed, information as to the character and extent of the surveys made or proposed, correspondence and action in connection with petitions for the re-establishment of lost corners, the renewal of monuments in poor condition, the correction of actual or supposed errors in survey lines, and the furnishing of information about areas, corner monuments, etc.

Details of work in the different divisions are given in the reports below by the several chiefs, and the usual schedule of work executed during the twelve months is added in Appendix No. 4.

#### DIVISION OF SURVEY INSTRUCTIONS AND GENERAL INFORMATION.

*(H. G. Barber, Chief of Division.)*

The work of the division consists, in general, of the preparation of instructions for the surveyors who are engaged in the field operations, the entering of all survey returns in the various registers, the issuing of all preliminary plans except for the townships in the Railway Belt of British Columbia, the answering of requests for information received from the general public and from other branches and departments and the issuing of the annual report of the branch.

During the twelve months just ended the total number of draft letters and memoranda was 9,592, an increase of more than fifteen per cent over the preceding year.

Two hundred and fifty-seven drafts of instructions were issued to surveyors for the execution of various surveys; this involved the preparation of 3,410 sketches and 103 maps and tracings.

Two thousand two hundred and nineteen communications from settlers and others and inquiries from other branches and departments were dealt with. This necessitated the preparation of 455 sketches, 179 maps and plans and the copying of 345 pages of field notes. Two thousand and ninety-five sketches were also copied for the information of other branches.

Thirty descriptions of parcels of land were drafted and a number checked and revised for other branches.

Preliminary plans were issued for 275 townships. These plans allow of the land being opened for entry at once without waiting for the final examination of the surveyor's returns and the issue of the official plans. Four copies of each plan are required. Up to the present time this division has prepared these plans for all townships in Manitoba, Saskatchewan and Alberta, those for the townships in the Railway Belt of British Columbia having been made by the British Columbia Division of the branch. It has recently been decided that in future all preliminary plans are to be issued by this division. As six copies are required of each of the British Columbia plans, this will mean a considerable increase in the work of the division.

Plans of 948 townships and of thirteen townsites or settlements were received from the lithographic office, entered in the various registers and forwarded to the Survey Records Branch. Seventy-three sectional maps and 105 miscellaneous plans were also received and distributed.

During the year there were received from the surveyors in the field and entered in the office registers: 1,600 progress sketches, 382 books of field notes for townships surveys, 440 books and 1,111 plans for miscellaneous surveys, 251 timber reports, 229 statutory declarations, sixty books of azimuth observations in connection with the survey of block outlines and returns for magnetic observations and for seven timber berths. General reports were received from all the surveyors under daily pay.



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Their examination having been completed, 574 field books of township surveys and 206 books and 180 plans of miscellaneous surveys were placed on record.

For reference in the work of the office there were received from the Survey Records Branch 5,657 field books and 1,046 plans and from the Registration Branch 1,968 files.

The preparation of the third edition of the pamphlet entitled "Description of the surveyed townships in the Peace River district in the provinces of Alberta and British Columbia" has been commenced. It is expected that it will be issued in a few months. More than two thousand copies of the second edition were distributed during the year.

After having been laid aside for some time through pressure of work, the preparation of a complete list of all the maps and publications which have ever been issued by this branch has again been put in hand. It is hoped to have this completed in a short time.

From topographical maps prepared last year schemes of subdivision for the summer resorts at Clear lake in Riding Mountain forest reserve, and at Madge lake in Duck Mountains forest reserve No. 2 were laid out and instructions for the surveys issued. At Banff an extension was made to the subdivision in the villa-lot section in accordance with the design prepared by Mr. Mawson, the expert on town-planning. Plans of each of the seventeen blocks, on a scale of twenty feet to one inch, were made and from these all the information necessary for the execution of the survey was calculated. On the completion of the survey at Banff, the surveyor's returns were examined and a plan of the subdivision was compiled for publication. A plan was also prepared showing the topography of the south and west slopes of Tunnel mountain at Banff. The returns of the survey of the townsite of Woodhaven, on Bedwell bay, in fractional township west of township 39 west of the Coast meridian, were examined, and further instructions for this subdivision were prepared.

During the year four members of the staff of the division resigned and two were transferred to other branches. Three of these vacancies have been filled and it is expected that another will be filled shortly. This will bring the strength of the permanent staff to twenty-two which is two less than it was during the preceding year. In addition to this there are at present two temporary technical clerks.

## DIVISION OF EXAMINATION OF SURVEYS.

*(T. S. Nash, Chief of Division.)*

The work of this division comprises the returns of survey of Dominion lands in Manitoba, Saskatchewan, Alberta, the Yukon and Northwest Territories, and in British Columbia, excepting township subdivision in the Railway Belt.

In addition to examining the correctness of the returns, all the required official plans are also prepared in this division.

Surveyors in the field are required to submit, from time to time, sketches showing the progress of their work. These are examined to see that correct methods are being employed and that satisfactory results are being obtained; 100 progress sketches from inspectors, 285 from contractors and 1,027 from men employed by the day were examined.

The investigation and retraverse of lakes and former lake beds by stadia was continued by twelve surveyors, and has now become established as a part of the work.

Owing to the staff being shorthanded, and to the desirability of issuing the amended township plans with as little delay as possible, these stadia surveyors were again permitted to prepare from their field notes the amended township plans. Their field notes and the township plans have been checked by the regular staff; 103 field books and 697 plots comprised the final returns of stadia surveys in 541 townships.



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Including these stadia surveys, examination has been made of 310 subdivisions, 133 miscellaneous surveys and 563 township outlines. Memoranda on examination of returns were sent to the number of 349, and 325 replies were received and the necessary corrections made. The number of draft letters prepared was 2,254. Thirty contract accounts were prepared and closed as the work was shown by the inspectors' reports to be satisfactorily done. Compiled plans of 833 townships were completed, 248 of which were first edition plans. Compiled plans of 13 miscellaneous surveys and 11 settlements were also completed.

With regard to the Yukon Territory, sixty-two group lot surveys and seven base line and reference traverses were received and examined. Eighteen additional sheets of the Yukon map in the Stewart river district are almost completed.

Mineral claim surveys from the Beaver lake district in northern Saskatchewan have been dealt with to the number of forty-four, from Hudson bay thirty, and from other parts nine.

Inquiries from other branches of the department involved the writing of 324 memoranda, the preparation of 196 sketches and the calculation of 614 areas. The returns of seven timber berth surveys were examined and two timber berth plans prepared.

Plans of road diversions submitted by the provincial governments to the number of 541 have been examined and sent to be recorded. Of railways, eighty-five plans of right of way were examined, representing 3,045 miles of line. As two or more copies of many of these plans were submitted, the gross mileage of plans examined was 4,886.

The numerical strength of the staff which was formerly twenty-nine, is now reduced to twenty-four, of whom two have been on active military service since last August, and two have been absent on account of protracted illness.

#### DRAFTING AND PRINTING DIVISION.

*(C. Engler, Chief of Division.)*

#### *Township Plans.*

The preparation for printing of township plans constitutes the most important part of the work and takes up most of the time. During the year, 833 township plans have been prepared. Areas of lands patented are now omitted, so that as settlement proceeds the plans become simpler as regards areas shown. As the prepared copies after being photographed are filed for use in subsequent editions, and as we have now a large number of such copies, the work of preparing later editions is in many cases reduced; in others the changes required for the later editions are such as to call for complete new copies.

Closely connected with the preparation of plans of complete townships are occasional plans of small portions of them. These are asked for when it is desired to deal with a part of a township, and for some reason it is impossible to deal with the whole. An edition of such plans is not printed, but from four to six copies are made by hand.

The first plans of townships printed by the department were in colours to show topography. The editions of many of these have become exhausted, and it is necessary to reprint them. In some cases this has been done by simply photographing a print of the old edition, but where the colours do not permit of this being done the black portions of the plans are redrawn, photographed and printed, and the colours are then printed in the usual way.



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*Miscellaneous Surveys.*

Twenty plans of such surveys were prepared. They include settlements, town-sites, and subdivisions of which editions were printed, but do not include the occasional copies of plans made by hand for various purposes.

*Surveyors' Sketch Maps.*

In former years, our practice has been to print the sketch maps showing a surveyor's explorations for twelve miles on either side of base lines or meridians on a scale of six miles to an inch with an accompanying profile of the line on a vertical scale of 1,000 feet to an inch. The number of such maps has been increasing every year so that at last our facilities for printing them were greatly taxed; the cost of the paper was also a considerable item. It has therefore been decided to reduce the scales of these maps so that for the present issue they may be printed all on a single sheet, the horizontal scale being 12.5 miles to an inch and the vertical 2,000 feet to an inch. It may be remarked that while this reduction in scale saves printing and paper it increases the draughtsman's troubles as there is scarcely room for putting down legibly all the data to be shown. These maps are issued with the report of the branch.

*Miscellaneous Work.*

This department of the work is increasing every year and as each part of it requires individual treatment, the amount of time required is considerable. It includes fourteen plans to accompany Orders in Council, the mounting of seventy-six maps and the completing of 176 jobs of a miscellaneous character. The astronomical field tables have been rearranged and are now printed on three small folders instead of one as formerly.

## BRITISH COLUMBIA SURVEYS DIVISION.

(*E. L. Rowan-Legg, Chief of Division.*)

The work of this division consists of the preparation of preliminary plans from sketches sent in by surveyors, showing the progress of their work in the field, the examination of surveyors' field notes and plots, the compiling of township and other plans, the comparing of fair copies of township and other plans and replying to requests for various information.

The work done has been as follows: Preliminary plans compiled, 107, and copies made, 180; surveyors' field notes of subdivision surveys examined, thirty-two, and plots fifty-one; mineral claims, eight; field books of miscellaneous surveys, seven, and plans twenty-six; township plans compiled, seventy-two; miscellaneous plans compiled, ten; townsite plans compiled, one; fair copies of compiled plans compared, eighty-three; various plots and sketches made, 228; odd jobs and requests for various information dealt with, 677; draft letters and memoranda written, 608.

In June, 1914, the inspector of surveys in the Railway Belt, British Columbia, reported that the field book in use was inadequate, as it did not contain more than one-third of the notes taken in the field.

Specimen pages for a new book were prepared and sent to the surveyors for their opinions and for suggestions for the improvement of these pages.

The surveyors were unanimously of the opinion that the proposed books would be a distinct improvement on the old ones, and they offered some valuable suggestions, which were acted upon in the preparation of the new books.

To replace the old book, these new books have been prepared, one for final returns, one for field use, and one for the recording of astronomical and magnetic observations.



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The pages for field notes in the books for final returns and for field use are designed to contain the notes of either a section or a quarter-section boundary, and are ruled into squares to facilitate the recording of topographical features.

The opposite page is ruled to contain data for the calculation of horizontal and vertical distance.

Both books contain pages for calculation by latitudes and departures.

The book for field use contains blank pages interleaved for calculations appertaining to the field notes or the latitudes and departures. Waterproof detachable covers are provided with these books.

The book for recording astronomical and magnetic observations is made of pocket size, and contains ruled forms for entering observations for time and azimuth on the sun and stars and for variation of the compass needle.

Much time and thought were given to the preparation of these books so as to make them as complete and useful as possible.

The staff of this division has been reduced to four, one being absent on active military service.

#### SECTIONAL MAP DIVISION.

*(J. Smith, Chief of Division.)*

##### *Compiling Room.*

The compiling of new sectional maps and the revision of those already issued in order to keep them up-to-date, forms the chief work of this room. During the year, seven new sheets were compiled, and revised editions were prepared of fifty-five sheets. Plotting is done on a scale of two miles to one inch, and every effort is made to secure all available information.

The chief sources of information are the following:—

(1) Township plans, settlement plans, townsite plans, etc.; also field books and reports sent in by surveyors. Eight hundred and seven such were examined during the year.

(2) Railway location and construction plans on file with the Railway Commission. Eighty-seven plans were borrowed and used during the year. The working time-tables of the railroads were also searched for names and positions of stations.

(3) Until this year information relative to the positions of post-offices was furnished by the officials of the Post Office Department on cards supplied for the purpose. A new method is now being employed. When a sectional map is about to be revised a diagram is made out for each post-office and mailed direct to the postmaster with a request to check it over and make any corrections necessary. Considerable correspondence is involved, but the results are proving satisfactory. Four hundred and two of such cards and diagrams were received, and the information plotted.

(4) Seventy-nine plans and blue-prints of Indian reserves, forest reserves and Dominion parks were received and used in compilation.

(5) Road diversions are being constantly made by the provincial governments, and plans of these are filed with the Survey Records Branch. Four hundred and twenty-seven such plans were received and plotted.

(6) Valuable information was secured from sketch maps furnished by base-line surveyors and from maps and reports of the Geological Survey, Irrigation Branch, Chief Geographer's office, etc.; for sheets lying partly in British Columbia, maps published by the Government of that province were searched. Three hundred and sixty-eight of these miscellaneous maps, sketches and reports were utilized.

In addition to the work outlined above, this office compiles and edits the yearly pamphlets containing reports of surveyors. Reports received from surveyors from July 1, 1913; to July 1, 1914, were compiled and sent to print and have since been



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issued in five pamphlets, totalling 208 pages. Work was also begun on the pamphlets containing reports for the period from July 1, 1914, to March 31, 1915.

Since the initiation of the surveys of Dominion lands, surveyors have been required to make reports on townships covered by their surveys. In 1886 the reports received up to that time were issued in five pamphlets. From that date until 1903 the township reports were not issued at all. In 1903 they began to be printed as part of the annual report of the Topographical Surveys Branch, and since 1909 they have been published in yearly pamphlets.

It is proposed now to combine into volumes of convenient size all the township reports received to date, and it is estimated that twenty volumes of about 250 pages each will be required. The first of these, comprising all reports on townships east of the Principal meridian, has been compiled and sent to the printer; another is ready to send, and two others are in hand.

The work of examining the sketch maps sent in by base-line surveyors which was formerly done in another division of the branch was taken over by this division in November, and has since that time kept one man constantly employed. Thirty-four such sketch maps have been received and examined and compared with the surveyors' field notes. Tracings of these have also been made for blue-printing.

*Mapping Room.*

The usual work on the sectional maps has been continued.

Eight sheets have been reprinted without being revised, fifteen sheets have been revised and reprinted, and fourteen new sheets, covering an area of about fifty-one thousand square miles have been published.

A map of "Banff and vicinity," was also prepared and published on a scale of one mile to an inch; this map shows the Bow valley, and adjacent country from "The Gap" to Castle mountain.

A map defining the boundary between British Columbia and Alberta, on a scale of one mile to an inch, is being made but is not yet completed.

The permanent staff consists of eighteen clerks, an increase of two over that of last year.

## SPECIAL SURVEYS DIVISION.

*(G. Blanchard Dodge, Chief of Division.)*

*Base-Line Surveys.*

The investigation of base lines and meridians for the purpose of locating and correcting errors of survey has been continued, and a surveyor has been employed in the field in retracing lines on which errors have been found to exist.

This work was begun in 1912 after it became known that some large errors existed among the older surveys in and around Manitoba, and the work has since been gradually extended to include all base lines and meridians so far surveyed. This work has been considerable, for in order to make the investigation of the bases and meridians complete many outlines in addition required to be examined, and the bases and meridians alone aggregate some 19,000 miles. For areas covered by recent surveys this work can be done with comparative rapidity, but among the older surveys, where measurements were not always accurate and entries in the surveyors' field notes often purely conventional, the work is multiplied many times.

On all the bases and meridians, complete returns of survey require to be examined, correspondence files read, theoretic as well as chained distances computed, bearings examined and deflections computed, corrections for elevation above sea-level and for latitude applied, block closings checked, results of latitude observations compared with the results of line surveys, widths of fractional ranges computed, chained lengths of bases between meridians compared with corresponding theoretic lengths, and finally the location, magnitude, direction and cause of any errors determined.



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From the results of this work, sketch maps are in course of preparation showing the positions on the ground of all surveyed bases relatively to where they should be, and the differences in latitude between surveyed, theoretic, and sea-level values of each. In this way the framework of a system of control is being formulated which it is hoped will prove efficient.

Besides the investigation of base lines already run, this work includes also the draughting of technical instructions to surveyors making surveys of new bases and to surveyors making retracements of old lines for the purpose of locating or correcting errors.

### *Astronomical Work.*

*Azimuth Observations.*—During the year the observations for the azimuth of base lines and meridians taken during the season 1913 and 1914 have been received and examined. The same high degree of accuracy found in the returns of the previous year is shown in these results. The errors existing in the bearing of the line are now very small, seldom more than  $10''$ , this being due to the frequency with which observations are taken, the accuracy of the observations, the care taken in applying the correction and the precision with which the line is run.

The new base-line transits are well adapted to the work. The horizontal circle is graduated every  $5'$  and is read by two micrometer microscopes having a magnifying power of about 53. The micrometer head is divided into 60 equal parts, each division corresponding to  $5''$  and the readings are estimated to seconds. The telescope is fitted with a micrometer eye-piece. As this eye-piece can be rotated in a plane perpendicular to the optical axis of the telescope, it may be conveniently used for measuring both horizontal and vertical small angles such as for azimuth observations when running a meridian, the telemetric measurement of distances and for latitude observations by Talcott's method. Azimuth observations are generally taken in daylight, but for latitude or other work desired at night the instrument is fitted with a complete system of electric illumination. A full description of the instrument is in course of preparation, and will be published in monograph form.

*Latitude Observations.*—Checks on the positions of base lines in the district between lake Athabaska and British Columbia were required, and a surveyor took observations for latitude with the zenith telescope at four points therein. The results of these observations when checked and the necessary computations made, were found to be satisfactory. No large errors were found to exist in the latitudes of the bases.

*Astronomical Field Tables.*—The astronomical field tables for the year have been prepared and issued. The field tables were first issued in 1903, when they were made out for periods of six successive months; they were set up in type and printed on a single sheet of strong paper, fifteen by six inches, folding to three by six inches for the pocket, and contained a table for finding the pole star and the astronomical meridian, a list of time stars, a table of the sun's apparent right ascension, a small map showing approximate magnetic bearings of astronomical north in western Canada, and diagram showing at a glance the latitude, longitude, and convergence of meridians for any point of the system up to township 80. It was then thought that the field tables would greatly simplify the taking of astronomical observations for azimuth. They were greatly appreciated by surveyors and were soon found to make possible a distinct increase in the accuracy of subdivision surveys. They are now of such service to surveyors as to be considered indispensable. Numerous changes have been made since their first appearance however. Each set of tables for the azimuth of Polaris is now made to cover either two periods of three consecutive months or three periods of two consecutive months in successive years. The reason for this is that the position of Polaris for a given period in one year is approximately the same as its position for a different period in the preceding or following year, so that by a judicious combination of months in different years a great increase in the accuracy of the tables is obtained.



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The gradual northward advance of settlement, which of course must be preceded by the surveyors, has necessitated the tables and diagrams being extended as far north as township 140, and the better class of instruments now used has made desirable the addition of many stars of the second and third magnitude to the list of time stars.

Delay in issuing the tables is avoided by having prepared special printed forms on which the variable matter of the tables is stamped as soon as obtained from the computing office, and the finished table is then reduced and printed by photo-zincography.

As explained in last year's report, it is now necessary to issue the field tables in two sets, one set giving data for the reduction of stellar observations, and the other giving data for solar observations. Each is printed on sheets of strong paper, sixteen by six inches, folding to pocket size of four by six inches.

The diagrammatic map giving the astronomical bearings of magnetic north in western Canada is now omitted from the field tables. It was necessarily of a very rough and approximate nature, as until recently very little information has been available on this subject. The large amount of data respecting magnetic declination at points in the western provinces, which have been obtained from surveyors in recent years, has made possible a much more accurate representation of the isogonic lines over western Canada. A map has been compiled on a much larger scale than the former one, showing the results of this magnetic work. It is printed on stiff cardboard of convenient pocket size.

The extension of the tables for the azimuth of Polaris, and the peculiar effects which the phenomena of precession and nutation have upon the apparent motion of Polaris, have made necessary an investigation into the accuracy of the tables as they are now presented, and the advisability of increasing their accuracy by some radical change in the form of the tables. This has been done during the year. The maximum error of the tables for township 140 exceeds half a minute on only a few days of the year, and for but a few hours on each of these days. At all other times the error is well under half a minute. The errors for the more southern townships are less than for township 140; thus, the errors of the tabulated figures for township 80 rarely approach and never exceed half a minute of arc, while those for townships farther south are still less. This gives a sufficient accuracy for ordinary subdivision and traverse work, and it was therefore decided that no change in the field tables is yet required. It has also been shown that any desired increase in the accuracy of the tables could only be obtained by adopting a much less convenient arrangement than the present one, or by greatly increasing the frequency with which the tables are issued, with a consequent increase in the computing. Some such change may become necessary in the future.

*Magnetic Survey.*

Fifty surveyors were instructed to observe for magnetic declination and during the miscellaneous surveys made by R. C. Purser, D.L.S., observations for magnetic dip and total force were taken at twelve stations. The results are given in Appendix 62.

During the season of 1913, R. C. Purser, D.L.S., and G. A. Bennett, D.L.S., were both engaged in taking observations for magnetic dip and total force, but this season owing to the nature of his work, Mr. Bennett was not available. This accounts for the smaller number of observations taken this year.

Every observation for magnetic dip and total force consisted of a dip, a total force, and a dip, the mean dip being used in working out the total force. This complete observation was duplicated at every station, and the average range found to be comparatively small. The instrument used was a Dover dip circle, the total force constant of which was determined both at the beginning and end of the survey season. This constant was the mean of at least six observations, and the probable error in each case was less than .0001 c.g.s.



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The index correction to the compass of every transit used for observing was determined both at the beginning and end of the survey season. If a serious discrepancy was found between the two determinations, it was investigated, and unless the discrepancy could be satisfactorily explained, the observations taken with the instrument were rejected. Every observation for magnetic declination has been checked and plotted on a large-scale map. They also have been reduced to the mean of the month in which they were taken, by means of the daily records of the declinometer at Agincourt, except those that were taken at times when the records were not observed. In the appendix, those observations that are not reduced to the mean of the month are marked by an asterisk.

|   |       |
|---|-------|
| Returns of magnetic declination received to date for 1914.. . . . | 1,439 |
| Previous returns since 1908.. . . .                               | 5,414 |
| Total returns to date.. . . .                                     | 6,853 |
| Dip observations received for 1914.. . . .                        | 62    |
| Previous returns since 1908.. . . .                               | 289   |
| Total force observations for 1914.. . . .                         | 46    |
| Previous returns since 1908.. . . .                               | 214   |

### *Surveying Instruments.*

The instrumental equipment of the surveyors employed in the field was inspected during the year, and those whose equipment was not satisfactory were required to provide themselves with approved instruments.

Repairs were made to fifty-five transit theodolites, twenty-seven dumpy levels, twelve surveying aneroids, one zenith telescope, six rod levels, nine cameras, two stadia rods, three precise levelling rods, and three clinometers.

Thirty-three sidereal watches and one box chronometer were overhauled and readjusted.

The surveying instruments shipped during the year comprised 285 packages weighing 15,126 pounds, while 225 packages weighing 12,732 pounds were received.

A statement of the surveying instruments on hand on March 31, 1915, showing also the instruments purchased and sold during the year, is given in Appendix 64.

### *Surveys Laboratory.*

The regular work of the Surveys Laboratory during the past year has included complete tests of one block survey transit, forty-two D.L.S. subdivision transits, one alidade, and six levels. Partial tests were made of one block survey transit and twenty-eight D.L.S. subdivision transits. The index corrections of nineteen aneroids, the value per turn of five microscope screws, the linear distance between cross hairs of four extra diaphragms, and two level values were determined. Besides the above, thirty-eight sidereal watches have been submitted for trial.

For the past two years a number of parties have been engaged in the field in making traverses of lakes. The stadia has been found to be the most rapid and convenient method of doing this work, and has been used exclusively. The stadia constants of each instrument used are determined at the Surveys Laboratory, and stadia correction tables were computed and printed for the use of the surveyors in the field. Fifty-one such cards in all were printed.

In connection with the testing and rating of the watches and laboratory time pieces, twenty-seven time observations were taken.

Of the thirty-eight watches tested, twenty-six were new and twelve had been previously tested, rejected, and returned to the makers for readjustment. There were fifteen watches which passed the test, seven of them being new and eight old, i.e., thirty-nine per cent passed as against fifty-seven per cent in 1914.

The results of the trials of the fifteen watches which passed are given in Appendix 63.



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The watches tested and supplied to surveyors are cheap ones, costing only \$45. Better watches are not procured because it is inevitable that in the course of a surveyor's operations the watch may be submitted to extreme cold, and the finer watches would become no better than the cheaper ones. The conditions of the test were given in our report of last year. All watches which are successful in passing the "Standard of Test" are given marks for isochronism, position, adjustment, and temperature compensation as follows:—

With the theoretically perfect watch  $\alpha$  would be = 0 and would get 400 mks.  
 $\beta$  " = 0 " " 400 "  
 $\gamma$  " = 0 " " 200 "

A watch which had just succeeded in passing the "Standard of Test" would have:—

= 0.75 and would get 0 marks.  
= 3.5 " " 0 "  
= 0.3 " " 0 "

Denoting by X, Y, Z, the corresponding numbers merited by the watch

$$\begin{aligned} X &= \frac{1600}{3} (0.75 - \alpha) \\ Y &= \frac{800}{7} (3.50 - \beta) \\ Z &= \frac{2000}{2} (0.30 - \gamma) \end{aligned}$$

and the total marks for the watch:—

$$S = X + Y + Z.$$

For the fifteen watches which passed, the average errors for isochronism were as follows:—

| P.U.  | P.R.  | P.L.  | D.U.<br>40° | D.U.<br>65° | D.U.<br>90° | D.D.  | P.U.  |
|-------|-------|-------|-------------|-------------|-------------|-------|-------|
| 0s.54 | 0s.53 | 0s.54 | 0s.65       | 0s.53       | 0s.52       | 0s.41 | 0s.54 |

The smallest error for  $\alpha$  was 0s.41.

The average errors for position were:—

| P.U.  | P.R.  | P.L.  | D.U.  | D.D.  |
|-------|-------|-------|-------|-------|
| 1s.53 | 2s.68 | 3s.02 | 1s.43 | 1s.49 |

The smallest error for  $\beta$  was 1s.23.

The average temperature coefficient was 0s.08, two watches have coefficients of only 0s.02.

Comparing the average errors of the watches which passed with those for 1913 and 1914, we have the following:—

|                                    | 1913. | 1914. | 191 . |
|------------------------------------|-------|-------|-------|
| Average error for isochronism..... | 0s.59 | 0s.45 | 0s.53 |
| " " position.....                  | 2s.58 | 2s.03 | 1s.89 |
| " " compensation.....              | 0s.14 | 0s.10 | 0s.08 |

As noted in 1914, the lowest average error in isochronism for both the watches which passed the test and those which failed was in the D.D. position. The largest average error in isochronism is for those which passed, as in 1914, in the P.U. position, but for those which failed, the largest error is in the P.R. position. In position, the largest average both for those which passed and those which failed is in the P.L.



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position. Of the twenty-three watches which failed: four, or seventeen per cent. failed in isochronism; fourteen, or sixty-one per cent in position; and five, or twenty-two per cent, in both isochronism and position. All passed the test for temperature compensation.

At the Comparator building, the lengths and weights of ninety-four tapes of all kinds, and two invar wires were determined. Fifty-eight intercomparisons of the laboratory standards were made, and two precise levelling rods were tested.

The comparator base was verified twenty-five times by the standard four-metre rule. The first verification was made in September, and they have been made at regular intervals of time since. They appear to show a regular long period change in the length of the base. When a longer interval of time has elapsed we will be in a better position to make a study of this change.

The work of improving the apparatus has been carried forward as far as time would permit. At the Surveys Laboratory besides minor improvements, an air pump of the water-jet type has just been installed whereby reduced pressures may be maintained for extended periods in the air receiver. This apparatus will enable a more thorough examination of the behaviour of aneroid barometers to be made than has been hitherto possible.

When the Comparator building was erected, the intention was to heat it by gas. This has been tried but has not proved a success. The fumes from the gas affected the apparatus and made the room very trying to work in. It was decided therefore to try electric heating. The full system consists of heaters and automatic control. At the present time, we have only the heaters. But even this is a great improvement, and has given good satisfaction. With care the building is capable of quite close regulation, and the daily temperature of the test room may be controlled within a small range. Tests can now be carried on at a practically uniform temperature very close to 62° Fahrenheit except during the extreme summer weather. We hope later to be able to install the automatic control, when still better results are expected. The cost of the electric heating has proved to be not any greater than that by gas. Between tests in the warm weather the ventilators and air intakes are closed during the day, and opened at night, when a current of cool air is forced through the building by means of blower fans. The extremely well insulated walls and ceiling usually prevent any excessive rise in temperature during the daytime.

The apparatus installed in the Comparator building, for the testing of measures of length, will be fully described elsewhere. In addition to the regular tests, some important experimental work has been done. The object of this was to investigate the characteristics of the apparatus, and the degree of precision which might be expected from it. That part of the work referring to the comparator base is not yet complete, but some interesting results have already been attained on the secondary apparatus. These go to show that this is capable of giving results beyond our best hopes and of a degree of accuracy far greater than that needed for most practical purposes.

In comparing tapes directly with the bench-marks, many precautions are entailed, and it was decided therefore that a secondary apparatus should be constructed so that surveying tapes might be quickly and accurately compared with the laboratory standards, which in turn are periodically referred to the bench-marks. Briefly, this apparatus consists of a series of pulleys, mounted in pairs, so that the two tapes are supported independently. At the ends are grooved pulleys supporting the wires imparting tension to the tapes, the tension being applied by means of weights. Micrometer microscopes at the two ends of the tape are used in making comparisons. The zeros of the tape and standard are brought into coincidence under one microscope, and readings are taken with the other. The supporting pulleys are spaced one hundred inches apart. With this spacing, the effect of differential sag may be neglected when the weights of the tapes agree within certain ordinary amounts. But the increased



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friction due to the introduction of a large number of pulleys may prove to be a source of error sufficient to more than offset any errors that may arise from an erroneous correction for differential sag. If the apparatus is to be efficient, the friction must be reduced to a minimum. This point was kept in view during the design and construction of the apparatus. How successful was the result may be gauged from the tests which follow and also from the fact that it was found necessary to apply the tension weights at but one end, otherwise the tapes would not maintain their relative position for the short space of time required to take readings. As in use at present, the zero end of the standard is attached to a fixed point and that of the tapes to a slider having a fine longitudinal screw adjustment. The pulleys are of the lightest possible design consistent with the necessary strength and were carefully machined. They are mounted on ball bearings, also accurately made and adjusted.

The object of the experiments described below was to find out the amount by which the friction in the apparatus would affect the results obtained in the standardization of tapes.

The first test consisted in finding the force necessary to overcome friction in the apparatus. This was first done with the tape hanging in a single catenary, so that only the two grooved tension pulleys were involved, and then a similar test was made with the addition that the tape was supported along the intermediate pulleys. A sixty-six-foot steel tape was used in these tests, which were carried out with both a wire and a cord passed over the tension pulley. The pulleys were set in four positions 90° apart, and weights were added at one end until the tape began to move. The experiment was then repeated with every condition the same save that weights were added at the other end.

The following shows the results:—

*Friction Test.*—To determine the amount of friction in secondary apparatus. Tape: Steel tape, sixty-six feet under tension of ten pounds. (Cord connection.)

Average weight added for four positions of pulleys:—

End Pulleys only—

|                                   |               |
|-----------------------------------|---------------|
| Weight added at pulley A. . . . . | 0.019 pounds. |
| “ “ “ C. . . . .                  | 0.011 “       |
| Mean for two ends. . . . .        | 0.015 “       |
| Friction for one pulley only=     | 0.008 pounds. |

End Pulleys and nine intermediate pulleys—

|   |               |
|---|---------------|
| Weight added at pulley A. . . . .                             | 0.023 pounds. |
| “ “ “ C. . . . .  | 0.016 “       |
| Mean for two ends. . . . .                                    | 0.020 “       |
| (Friction for two end pulleys and nine intermediate pulleys.) |               |

Alteration in tension due to one end pulley, and nine intermediate pulleys, 0.012 pounds. (Working conditions.)

These results were obtained on the inner set of pulleys, used to support the standard. A similar determination for the outer set gave a value of 0.015 pounds for one end and nine intermediate pulleys. Using wire connections instead of cord for the tension weights, values of 0.014 pounds were obtained for each set.

This amount is seen to be very small. The correction to be applied from this source of error in testing a sixty-six-foot tape under the above conditions would amount to but approximately 1 in 10,000,000.

The test, though satisfactory from this point of view, gives no direct indication of the effect of friction on the determination of the length of a tape, and therefore a second series of experiments was made in order to detect, if possible, the exact amount by which readings are affected by friction in the apparatus. The tape and



standard were suspended on intermediate pulleys exactly as when making a regular test, and readings were taken first by bringing the zeros into coincidence from left to right and then in the opposite direction. When moved towards the zero by means of the adjusting screw, the tension at the zero end will be the sum of the weight and the friction in the pulleys; if the tape is moved in the other direction the tension at the zero end will be the difference of these. This difference in tension, if large enough to affect the readings, would cause the tape to show longer when moved towards the zero end than when moved in the opposite direction.

Tests were made on a sixty-six-foot tape, under tensions of ten pounds and ten kgs., and with a 100-foot tape under similar tensions. The two observers each made five settings and then changed places, so that, as far as possible, personal equations were eliminated. Three complete determinations were made under each of the above conditions; a typical example is recorded as follows:—

*Friction Test.*—To determine influence of friction on comparisons made with Secondary Apparatus:—

Steel tape, 100' T S 863. Compared with T S 805 (laboratory standard tape.)

Tension=ten pounds.

| Settings toward Zero—Microscope readings.                         |                 |                     | Settings from Zero—Microscope readings.                           |                 |                     |
|---|-----------------|---------------------|---|-----------------|---------------------|
| Standard.   |                 | Tape.               | Standard.   |                 | Tape.               |
|   | (Obs.—W. G. H.) |                     |   | (Obs.—W. G. H.) |                     |
| 7 797 <sup>mm</sup>   |                 | 8 529 <sup>mm</sup> | 7 785 <sup>mm</sup>   |                 | 8 503 <sup>mm</sup> |
| 795   |                 | 527                 | 785   |                 | 511                 |
| 796   |                 | 531                 | 784   |                 | 511                 |
| 794   |                 | 533                 | 785   |                 | 512                 |
| 797   |                 | 535                 | 788   |                 | 512                 |
|   | (Obs.—W. J. L.) |                     |   | (Obs.—W. J. L.) |                     |
| 7 805   |                 | 8 522               | 7 805   |                 | 8 520               |
| 806   |                 | 529                 | 803   |                 | 525                 |
| 801   |                 | 525                 | 803   |                 | 529                 |
| 808   |                 | 530                 | 802   |                 | 528                 |
| 810   |                 | 529                 | 805   |                 | 526                 |
| Average value, tape longer than standard by 0.728 <sup>mm</sup> . |                 |                     | Average value, tape longer than standard by 0.724 <sup>mm</sup> . |                 |                     |

Tape apparently .004<sup>mm</sup> longer when brought towards zero.



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The following is a summary of all the tests:—

*Friction Test.*—To determine influence of friction on readings obtained with Secondary Apparatus:—

| Conditions.                          | Variation<br>of tape from standard. |            | Difference. |
|--------------------------------------|-------------------------------------|------------|-------------|
|                                      | To zero.                            | From zero. |             |
|                                      | mm                                  | mm         | mm          |
| 66' steel tape. Tension=10 lbs.....  | 0.145                               | 0.138      | 0.007       |
|                                      | 0.148                               | 0.140      | 0.008       |
|                                      | 0.170                               | 0.168      | 0.002       |
| 66' steel tape. Tension=10 kgs.....  | 3.125                               | 3.115      | 0.010       |
|                                      | 3.120                               | 3.114      | 0.006       |
|                                      | 3.122                               | 3.112      | 0.010       |
| 100' steel tape. Tension=10 lbs..... | 0.728                               | 0.724      | 0.004       |
|                                      | 0.729                               | 0.727      | 0.002       |
|                                      | 0.731                               | 0.726      | 0.005       |
| 100' steel tape. Tension=10 kgs..... | 0.096                               | 0.080      | 0.016       |
|                                      | 0.099                               | 0.085      | 0.014       |
|                                      | 0.101                               | 0.092      | 0.009       |

Although it appears possible to detect the effect of friction in the above, yet this is very small. In the example completely recorded, which shows the usual variation in a set of individual readings, the tape is apparently longer by .004<sup>mm</sup> when brought towards the zero. This is double the friction error and would cause an apparent error in the length of the tape of about 1 in 15,000,000. The various other tests give a maximum error of approximately 1 in 4,000,000.

The results tend to show that the friction is extremely small, and the slight influence on readings is within the degree of accuracy which is desired for any comparison on the secondary apparatus.

*Correspondence.*

The number of draft letters prepared was 1,612. Sixty-four letters of instruction to surveyors were prepared, and 454 memoranda written.

PHOTOLITHOGRAPHIC OFFICE.

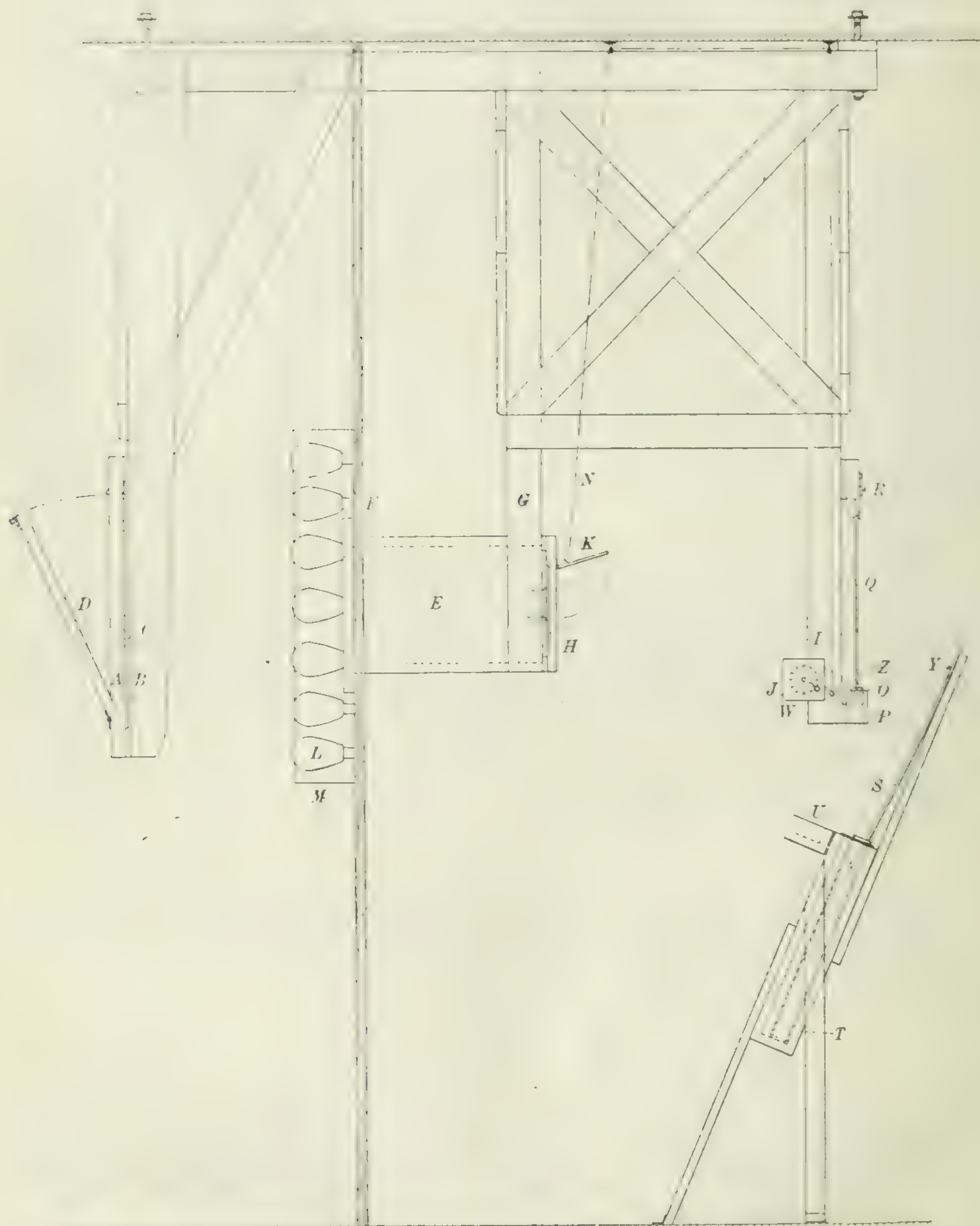
(H. K. Carruthers, Process Photographer.)

The work of this office has increased so much that it was necessary to install a second copying camera, and as the townships, which are of a standard size and reduction, comprise most of the work, it was decided to make it a fixed focus camera to take care of this particular work.



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A space in one corner of the room seven feet by thirteen feet was partitioned off and the camera hung partly in and partly out of this room.



This cut shows a vertical section of the apparatus, and is as follows:—

On the ceiling is bolted a heavy pine frame from which project the arms B, G, and I.



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On the arms B, which are outside the partition F, is fastened the copyholder A. This holder has a plate glass C fastened to the inside face, and against this glass the copy is held by the pressure from the hinged panel D.

The lens box E is screwed to the partition F, and on both sides of this box-opening is arranged fourteen 110-volt 200-watt high efficiency Tungsten lamps L with two reflecting mirrors M.

The arms G carry the lens board H and, to avoid vibration, hang free of the lens box.

As the exposure is made in the dark-room, a plate holder is unnecessary.

A glass plate is coated with collodion and placed on the ebonite dipper S, then lowered into the silver bath T. The hinged lid U is turned over into place to exclude light and dust.

After sensitizing is completed, which requires about four minutes' immersion, the plate is drawn up and the dipper S hung on hook Y to permit of the excess silver draining back into the bath. Before raising the plate the room is darkened, sufficient light coming through a large ruby glass window.

The plate is now taken off the dipper and placed in position for exposure.

On the arms I are wooden blocks P which are cut out to receive the ebonite plate-rest O. On this plate-rest the sensitized plate Q is laid and held firmly in position by the sliding catch R.

Directly behind the plate within arms' reach is the switch which controls the lamps L.

The exposure is timed by a Warwick meter J. The hand W being set, all that remains is to pull down the lever Z. This pulls the cord N and raises the lens cap K. When the hand W travels back to zero the lever Z is automatically released, closing the lens cap K.

The regular procedure is followed in developing and fixing the plate.

The developing trays and sink, being about three feet from the camera, considerable walking is saved, and the negatives are made more expeditiously.

A new marble switchboard with ammeter and rheostats was installed, adding materially to the safety and convenience of the numerous arc and other lamps, mercury tubes, etc., used in the office.

Hill work on the three-mile sectional maps which is in black on the old manuscripts, is now printed in brown. To avoid redrawing the sheets, the hills are stopped out on the negative by the retouchers.

The hill work is drawn separately on tracing linen by the draughting division in exact register with the black.

During the year a retoucher was added to the staff, bringing the total number up to eight, of whom one is absent on active military duty. A schedule of the work for the year is given in Appendix No. 6.

## PHOTOGRAPHIC OFFICE.

*(J. Woodruff, Chief Photographer.)*

The output of the photographic office shows a decrease as compared with last year. This is principally in the smaller sizes of velox prints and negatives, large numbers of which were formerly printed and developed for other branches of the service. This work had to be discontinued owing to the increasing size of and the longer time demanded by our own work, so that although the number of items is less than last year, the amount of work done is really greater.

In Vandyke and blue-print work only such sizes as can be conveniently handled in the limited space at our disposal are now done here, the very large tracings being sent to the Railway Lands Branch, where special equipment is available for doing such work.



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On the fixed focus enlarging camera, nearly 2,000 enlargements were made. This camera is used only for enlarging from topographical survey negatives. These are enlarged to a standard size of ten by fourteen inches on bromide paper, and the prints are used in plotting the survey.

This camera, which has been in use for many years, has been entirely remodelled in preparation for next season's work. The method of illuminating the negative has been changed. Four powerful nitrogen-filled Tungsten lamps are now used, and this together with a new lens has much improved the definition of the enlarged image. A new negative holder has also been added, which is unique in construction and a big improvement on the old one.

The changes will facilitate the working of the camera as well as improve the quality of the work.

The new enlarging camera which was installed last year, and of which a description was given in the report, has proved most satisfactory and is a great help in getting out the work of the office promptly.

The staff remains the same as last year, viz., one photographer and four assistants. A schedule of the year's work accompanies this report.

#### LITHOGRAPHIC OFFICE.

*(A. Moody, Foreman).*

Appendix No. 8 shows an increase of output over last year, the monthly average of plans printed being over 111, and the number of copies over 35,000. Many of these plans were printed in several colours, making the number of runs on the two power presses about 70,000. This is by no means a large run for two presses, but as the number of copies from each map or plan is small a considerable amount of time is spent in changing from one plate to another and again from one colour to another.

In addition to the regular work of this office, maps and plans have been printed for several other branches of the department, including maps of forest reserves for the Forestry Branch, plans to accompany Orders in Council for the Ordnance Lands Branch, and maps for the International Waterways Commission.

The printing of sectional maps on the three-mile scale in colours is being gradually carried out. For a time they were printed in black with a tint of blue for water areas. The next step was to print hills in brown and still later a green was added for forest reserves. These colours add greatly to the appearance and to the clearness of the maps, as well as to the work of the printers, the plates for all flat tints having to be made by them. The same is true also of the reprinting of plans of townships formerly issued in colours; here again all the colours, i.e., all the work except the black is done by the printers.

Owing to increase of work generally an additional transferrer was engaged.

#### GEOGRAPHIC NOMENCLATURE.

Mr. Whiteher, who has charge of this branch of work in the department, reports the usual examination of all the sketch maps, compiled township plans, sectional, and other maps, surveyors' reports, etc., and has also continued to act as a member and secretary of the Geographic Board of Canada. The annual report of the board, which is still published as a supplement to the annual report of this department, is now closed at the expiration of the fiscal year, instead of the former date, June 30, and includes all decisions rendered during the year, which had been previously published in *The Canada Gazette* and in bulletin form. The report was printed in English and French and largely distributed to Dominion and provincial officials, geographical societies, colleges and schools.



## SESSIONAL PAPER No. 25b

## BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

*(J. Aurele Cote, Secretary.)*

The Board of Examiners for Dominion Land Surveyors held three meetings during the year. The first was a special meeting lasting from April 28 to June 4 (inclusive), 1914, during which examinations were held at Ottawa, Toronto, Winnipeg, Regina, Calgary, and Edmonton. The second was another special meeting which took place on September 23, 1914. The third was the regular annual meeting called for by section 9 of the Dominion Lands Surveys Act. It began on Monday, February 8, 1915, and lasted until March 26, 1915. During this meeting examinations were held at Ottawa, Kingston, Montreal, Toronto, Winnipeg, Calgary, Edmonton, and Dawson. The total number of candidates for examination was 280. Of these, 201 tried the preliminary examination, seventy-three tried the final examination, and six tried the examination for Dominion Topographical Surveyor.

Twenty-eight candidates were successful at the preliminary examination as follows:—

*Preliminary Examination.*

|  |  |
|--|--|
| Alberga, George Frederick, Montreal, Que.      | Hogarty, Bertrand B., Winnipeg Man.        |
| Bradley, Nicholas Hilburn, Calgary, Alta.      | Jones, J. Donovan, Amherst, N.S.           |
| Brown, Leo. B., Holden, Alta.                  | McKittrick, Ernest S., Edmonton, Alta.     |
| Burchnall, Ralph Parker, Calgary, Alta.        | Meikle, MacKay, Ottawa, Ont.               |
| Burn, George Augustus Harold, Janetville, Ont. | Murphy, Charles Homan, Edmonton, Alta.     |
| Bysshe, Gordon Thomas, Ottawa, Ont.            | Nesbitt, Francis Grey, Sherbrooke, Que.    |
| Cormack, Alexander, Edmonton, Alta.            | O'Brien, J. Edwin, Toronto, Ont.           |
| Cox, Arthur George, Ottawa, Ont.               | Orr, William S., Cobourg, Ont.             |
| Caughlan, John Q., Chipman, Alta.              | Pringle, John Earle, Hamilton Ont.         |
| Crain, G. E., Ottawa, Ont.                     | Racknow, Ernest, Princeton, Ont.           |
| Duncan, Stuart MacPherson, Ottawa, Ont.        | Scott, Russell George, Toronto, Ont.       |
| Fraser, Andrew Stockwell, Ottawa, Ont.         | Somerville, William Johnston, Ottawa, Ont. |
| Greig, Joseph W., Kingston, Ont.               | Throop, Wilfred Earle, Brockville, Ont.    |
| Hemmerich, George, Conestogo, Ont.             | Walcot, John Bevan, Montreal, Que.         |

Forty-two candidates were successful at the final examination as follows:—

*Final Examination.*

|  |   |
|--|---|
| Alexander, John Bentley, Vancouver, B.C.       | Hardonin, Joseph, Calgary, Alta.                    |
| Beatty, Frank Weldon, Pembroke, Ont.           | Harper, Clarence Johnston, Orangeville, Ont.        |
| Beatty, William Benjamin, Sarnia, Ont.         | Hellferth, John Benedictus, Toronto, Ont.           |
| Benner, James King, Alvinston, Ont.            | Hotchkiss, Cyrus Percival, Edmonton, Alta.          |
| Beresford, Herbert Graham, Winnipeg, Man.      | Kinnear, Louis Arthur, Port Colborne, Ont.          |
| Browne, Ernest Frank, Ottawa, Ont.             | Leitch, John Strickland, Calgary, Alta.             |
| Brown, Lindsay Osborne, Ottawa, Ont.           | Lumb, William Ewart, Fort Stewart, Ont.             |
| Brown, Milton, Kitscoty, Alta.                 | MacLeod, David Douglas, Park Hill, Ont.             |
| Carson, John Alton, Vancouver, B.C.            | McCloskey, Michael D'Arcy, Chelsea, Que.            |
| Child, Cyril George, Calgary, Alta.            | McKusker, Knox Freeman, St. Louis de Gonzague, Que. |
| Coltham, James Thomas, Aurora, Ont.            | Meikle, Angus Urquhart, Kingston, Ont.              |
| Crowther, Keston Nelson, Qu'Appelle, Sask.     | Melrose, Thomas Montague, Coaticook, Que.           |
| Crouch, Milton Edwin, Toronto, Ont.            | Moran, Patrick Joseph, Kingston, Ont.               |
| Doze, Joseph Wilbert, Fort Saskatchewan, Alta. | Perron, Hermel Marie, Edmonton, Alta.               |
| Draper, Walter Harold, Edmonton, Alta.         | Robinson, William Earl, Columbus, Ont.              |
| Duffield, Hugh J., Calgary, Alta.              | Scott, Buckton Arthur, Essex, England.              |
| Ewing, Ernest Olliphant, Toronto, Ont.         | Shaver, Peter Albert, Calgary Alta.                 |
| Finnie, Oswald Sterling, Ottawa, Ont.          | Smith, Neville Herbert, Ottawa, Ont.                |
| Gass, Lawrence Henderson, Iroquois, Ont.       | Venney, Leonard Thomas, Brockville, Ont.            |
| Gibson Morton Milne, Willowdale, Ont.          | Zinkan, William Edward, Southampton, Ont.           |
| Gorman, Arthur Oswald, Buckingham, Que.        |   |
| Gourley, Robert Murray, North Bay, Ont.        |   |

The time of the board, during the meetings, was largely taken up with the reading and valuation of the candidates' answer-papers. Complete sets of question papers.



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to be used at the next examination were also prepared. In addition to this, the evidence submitted by candidates at the final examination, in proof of their eligibility therefor, had to be examined. This evidence consisted of certificates of provincial land surveyors and of affidavits of service under articles or apprenticeship.

Four candidates, who presented themselves for final examination, had not quite completed their time under articles. They were admitted on the understanding that, in case they were successful, their commissions would not issue until they had completed their apprenticeship and furnished affidavits in the regular form.

The board had to consider several applications which were received from college and university graduates asking to be admitted to the privileges of section 22 of the Surveys Act which provides for a shorter term of service under articles.

The Board of Examiners, wishing to facilitate in every way the enlistment for active service of articulated pupils, gave the following decision at one of its meetings: "That in all cases where a candidate is articulated to a Dominion land surveyor, time spent on active military duty would count as office time under articles to a Dominion land surveyor, but not as field time."

During the year a new edition of the "Rules and Regulations of the Board" was published. This edition is known as the "Ninth Edition," and contains several amendments to the former publication. Previously, marks were allotted to the various subjects in the order of importance, while now one hundred marks are allotted to each subject. This arrangement facilitates greatly the marking of the papers.

Forty-one commissions were issued to candidates who had passed the final examination, and had furnished oaths of office and allegiance and bonds for the sum of one thousand dollars, as required by section 25 of the Dominion Lands Surveys Act.

Thirty-one certificates of preliminary examination were issued to successful candidates who had complied with the requirements of the law.

Section 35 of the Dominion Lands Surveys Act provides that every Dominion land surveyor shall be in possession of a subsidiary standard of length. Fifteen new standards were issued to surveyors during the year. A list of Dominion land surveyors who are in possession of standard measures will be found in Appendix No. 9. A communication was received from the secretary of the Ontario Land Surveyors' Association pointing out that the O.L.S. standard measure was in every way similar to the D.L.S. standard, and asking that any Ontario land surveyor who becomes a Dominion land surveyor should not be required to procure a new standard. He was informed that there was no objection to his request, provided the standard was in good condition and was tested under the supervision of the Surveyor General at Ottawa.

Mr. F. D. Henderson, who had been secretary of the board since 1906, resigned his office during the year, and Mr. J. Aurele Cote, of the Topographical Surveys Branch, Interior Department, was appointed to the position in July, 1914.

The correspondence of the board was as follows: Letters received, 1,621; letters sent, 914; circular letters, pamphlets and parcels sent, 1,547.

#### APPENDICES.

No. 1. Schedule of surveyors employed and work executed by them.

No. 2. Schedule showing for each surveyor employed the number of miles surveyed, of township section line, township outline, traverses of lakes and rivers, and resurvey; also the cost of the same.

No. 3. Surveys in the Yukon territory returns of which have been received during the year.

No. 4. Details of the office work.

No. 5. Sectional maps of which new editions have been issued.

No. 6. Work executed in the photographic office.



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No. 7. Work executed in the lithographic office.

No. 8. Office staff of the Topographical Surveys Branch at Ottawa, as on April 1, 1915, with the name, classification, duties of office, and salary of each.

No. 9. List of Dominion Land Surveyors who are in possession of standard measures.

Nos. 10 to 61. Abstracts of reports of surveyors employed.

No. 62. Results of magnetic observations.

No. 63. Results of watch trials.

No. 64. List of surveying instruments on hand on March 31, 1915.

MAPS AND PROFILES.

The following maps and profiles accompany this report:—

Map showing surveys to March 31, 1915.

Maps to accompany reports of surveyors.

Profiles of meridians and base lines.

I have the honour to be, sir,

Your obedient servant,

E. DEVILLE,

*Surveyor General.*







# TOPOGRAPHICAL SURVEYS BRANCH

## SCHEDULES AND STATEMENTS

### APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915.

| Surveyor.            | Address.            | Description of Work.   |
|----------------------|---------------------|--|
| Akins, J. R...       | Ottawa, Ont...      | Survey of the 29th base line across ranges 2 to 24, west of the Fifth meridian.  |
| Aylsworth, C. F...   | Madoc, Ont...       | Resurvey in tp. 22-3-Pr., tp. 23-5-Pr., tp. 12-10-E., and tp. 14-11-E. Traverse in tp. 20-4-Pr.  |
| Baker, M. H...       | Toronto, Ont...     | Subdivision in tps. 12 and 16-1-4, tps. 14 and 15-5-4, tp. 17-6-4, tp. 21-8-4, tp. 20-9-4, and tp. 19-7-5. Retracement in tps. 14 and 15-5-4, tp. 20-9-4, tp. 5-14-4, and tp. 16-4-5. Resurvey in tp. 13-24-3, and tp. 9-12-4. Correction survey in tp. 23-29-3, and tp. 41-14-4. Traverse in tps. 1 and 20-4-4. Survey of lot in secs. 7 and 8, tp. 28-18-5. Restoration survey of the cemetery at Field. Traverse of roads from Field to Hector, from Field to Ottetail, from Field out the Yoho valley, and from Lake Louise station to Chateau Lake Louise. Posting of part of the townsite of Wymark. Retracement of coal claims along Sheep river in tp. 19-4-5. Survey of Moraine road in tps. 27 and 28-6-5.   |
| Bélanger, P. R. A... | Ottawa, Ont...      | Inspection of contracts Nos. 4, 6 and 19 of 1913, and Nos. 5, 6, 7, 8, 10, 11, 12 and 15 of 1914. Subdivision surveys in tp. 80-11-5 and tp. 80-12-5.  |
| Bennett, G. A...     | Tillsonburg, Ont... | Stadia surveys in tp. 36-14-3, tps. 35 and 36-15-3, tps. 35 and 36-16-3, tp. 35-17-3, tps. 31, 34 and 35-19-3, tps. 32 and 33-20-3, tps. 32, 34 and 36-21-3, tps. 31, 32, 33, 34, 35 and 36-22-3, tp. 34-23-3, tps. 27, 28, 29 and 30-24-3, tps. 27, 28, 29 and 30-25-3, tps. 27, 28, 29 and 30-26-3, tps. 27, 28, 29 and 30-27-3, tps. 26, 27, 28, 29 and 30-28-3, tps. 27, 28, 29 and 30-29-3, tps. 27 and 29-1-4, and tp. 28-3-4. Retracement surveys in tp. 32-14-4, tps. 31 and 32-15-4, tp. 34-16-4, tps. 34 and 37-17-4, tps. 35 and 36-18-4, tp. 35-27-4, tps. 34 and 35-28-4, and tp. 34-29-4. Correction surveys in tp. 38-18-4, tp. 38-19-4, tp. 37-25-4, and tps. 41 and 42-28-4. Traverse in tp. 55-24-4. |
| Blanchet, G. H...    | Ottawa, Ont...      | Survey of the 24th base line across ranges 12 to 25, and the 25th base line across ranges 13 to 25, west of the Fourth meridian. Retracement of the 24th base line across part of range 11, and the 25th base line across part of range 12, west of the Fourth meridian.   |
| Boivin, E...         | Chicoutimi, Que...  | Contract No. 16 of 1914. Subdivision of tps. 78, 79, 80, 81 and 82-17-4, and the north third of tp. 77-17-4.   |



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SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—Continued.

| Surveyor.              | Address.                 | Description of Work.   |
|------------------------|--------------------------|--|
| Boulton, W. J.. . .    | Wallaceburg, Ont.. . .   | Stadia surveys in tps. 7, 8, 9 and 10-15-4, tps. 7, 8, 9, 10, 11 and 12-16-4, tps. 7, 8, 9, 10, 11 and 12-17-4, tps. 7, 8, 9, 10 and 11-18-4, tps. 7, 8, 9 and 10-19-4, and tps. 8 and 9-20-4.   |
| Bowman, E. P.. . .     | West Montrose, Ont. . .  | Stadia surveys in tps. 7, 8, 9 and 10-15-4, tps. tps. 37, 38, 39, 40 and 41-14-3, tps. 37, 38, 39, 40 and 41-15-3, tps 36, 37, 38, 39 and 40-16-3, tps. 36, 37, 38, 39, 40 and 41-17-3, tps. 37, 38, 39, 40 and 41-18-3, tps. 51 and 52-21-3, tps. 51, 52 and 53-22-3, tps. 52 and 53-23-3, tps. 52 and 53-24-3, and tp. 52-25-3.  |
| Brenot, L.. . . . .    | Ottawa, Ont.. . . . .    | Survey of the east outlines of tps. 81, 83 and 84-24-6, and tps. 80, 83, and 84-25-6. Subdivision in tp. 83-17-6, tps. 82 and 83-18-6, and tps. 79, 80 and 82-24-6. Traverse in tp. 83-21-6, and tp. 81-25-6. Resurvey of Hudson's Bay Company's posts at Fort St. John and Hudson Hope.   |
| Bridgland, M. P . . .  | Calgary, Alta. . . . .   | Photo-topographical survey of the southern part of the Crowsnest Forest Reserve. Retracement of the triangulation of the Rocky and Selkirk mountains.  |
| Brownlee, J. H.. . .   | Vancouver, B.C.. . . .   | Survey of road from sec. 32, tp. 17, E.C.M., to sec. 19, tp. 18, E.C.M.  |
| Buchanan, J. A.. . .   | Edmonton, Alta.. . . .   | Contract No. 13 of 1914. Subdivision of tps. 85, 86 and 87-21-5, and tps. 85, 86, 87 and 88-22-5.  |
| Caiger, J. A.. . . . . | Lytton, B.C.. . . . .    | Subdivision in tps. 22 and 23-20-6, tp. 22-21-6, tps. 17, 18, 19 and 20-24-6, tps. 17 and 18-25-6, tps. 15, 16 and 17-26-6, and tp. 17-27-6. Traverse in tp. 23-20-6, tp. 22-21-6, tps. 18 and 19-24-6, tps. 17 and 18-25-6, and tps. 15 and 17-26-6.  |
| Christie, W.. . . . .  | Prince Albert, Sask. . . | Subdivision of tp. 71-20-4, tps. 70 and 71-21-4, and tps. 70 and 71-22-4; part subdivision of tp. 70-20-4, and tp. 72-22-4. Survey of east outline of tp. 72-21-4.   |
| Coltham, G. W.. . . .  | Aurora, Ont.. . . . .    | Stadia surveys in tps. 43, 45, 46 and 47-8-4, tps. 42, 43, 44, 45, 46 and 47-9-4, tps. 42, 43, 44, 45, 46, 47 and 48-10-4, tps. 42, 43, 44, 45, 46, 47 and 48-11-4, tps. 43, 44, 45, 46, 47 and 48-12-4, tps. 43, 44, 45 and 46-13-4, and tps. 43, 44, 45, 46 and 47-14-4.   |
| Coté, J. M.. . . . .   | Ottawa, Ont.. . . . .    | Subdivision in tp. 4-7-4, tps. 3 and 4-8-4, and tp. 3-9-4. Resurvey in tp. 51-23-3, tp. 51-24-3, tp. 22-10-4, tp. 21-11-4, tps. 21 and 22-12-4, and tp. 54-19-4. Correction survey in tp. 38-28-4, and 38-1-5. Retracement survey in tp. 20-1-4, and tp. 20-2-4.   |
| Cowper, G. C. . . . .  | Welland, Ont.. . . . .   | Stadia surveys in tps. 11, 12, 13 and 14-8-3, tps. 11, 12, 13 and 14-9-3, tps. 11, 12, 13 and 14-10-3, tps. 11, 12, 13, 14 and 15-11-3, tps. 11, 12, 13 and 14-12-3, tps. 11, 12, 13, 14, 15 and 16-13-3, tps. 11, 12, 13, 14, 15 and 16-14-3, tps. 11, 12, 13 and 14-15-3, tps. 10, 11 and 14-16-3, tps. 11, 12 and 13-17-3, tps. 9, 11, 12, 13, 14, 19 and 22-18-3, tps. 11, 12, 13, 14, 22 and 23-19-3, tps. 7, 8, 9, 10, 11, 12, 13 and 23-20-3, tp. 11-21-3, tp. 11-22-3, tp. 11-23-3, tp. 11-24-3, tps. 11, 12 and 17-25-3, tps. 11, 12 and 17-26-3, tps. 11, 12, 13, 14, 15, 16 and 17-27-3, tps. 11, 12, 13, 14, 15, 16 and 17-28-3, tps. 11, 12, 13, 14, 15, 16, 17 and 18-29-3, tps. 11, 12, 13, 14, 15, 16 and 17-30-3, and tps. 13 and 14-1-4. |



## SESSIONAL PAPER No. 25b

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Continued.*

| Surveyor.               | Address.                         | Description of Work.   |
|-------------------------|----------------------------------|--|
| Cumming, A. L. . . . .  | Cornwall, Ont. . . . .           | Subdivision of tp. 82-21-5 and tp. 82-22-5. Partial subdivision of tp. 84-20-5, tp. 83-21-5, tp. 83-22-5, and tp. 82-23-5. Traverse in tp. 70-27-4, tp. 72-2-5, tp. 72-3-5, tps. 72 and 73-9-5, and tp. 73-10-5. Retracement in tp. 73-6-5, tp. 84-21-5, tp. 84-22-5, and of lot 21, group 1, in tp. 72-2-5. Resurvey of road through lots 1 and 2 of Athabaska settlement.        |
| Davies, T. A. . . . .   | Edmonton, Alta. . . . .          | Contract No. 10 of 1914. Subdivision of tp. 81-21-5, tp. 81-22-5, tp. 81-23-5, tps. 78, 79 and 80-24-5, and the west half of tp. 81-20-5.  |
| Day, H. S. . . . .      | Edmonton, Alta. . . . .          | Contract No. 17 of 1914. Subdivision of tp. 83-16-4, and tps. 83, 84, 85 and 86-17-4. Survey of the east outlines of tps. 81, 82 and 84-16-4, tps. 81 and 82-17-4, and tps. 81 and 82-18-4.  |
| Deans, W. J. . . . .    | Brandon, Man. . . . .            | Inspection of contracts Nos. 13 and 26 of 1912. Nos. 21, 24, 25, 26, 27 and 28 of 1913, and Nos. 20 and 21 of 1914. Partial inspection of contract No. 13 of 1911. Subdivision of summer resort at Madge Lake in tp. 30-30-Pr., of lots in tp. 15-5-Pr., and in tps. 32 and 33-13-Pr. Survey of part of Grand Rapids settlement. Inspection of work done by R. J. Jephson in 1912. |
| Evans, S. L. . . . .    | Corinth, Ont. . . . .            | Subdivision survey in tp. 24-8-3 and tp. 24-9-3. Resurvey in tp. 39-13-3, tp. 16-21-3, and tp. 23-23-3. Retracement survey in tps. 24 and 26-8-3, tps. 24, 25 and 26-9-3, and tp. 26-10-3. Subdivision of lots at Clear Lake in tp. 19-19-Pr. Topographical survey of site for summer resort at Madge Lake in tp. 30-30-Pr.  |
| Fawcett, S. D. . . . .  | Ottawa, Ont. . . . .             | Settlement surveys at Pelican, Hay River and Fort Providence. Surveys of additions to settlements at Fort Resolution and Fort Simpson.   |
| Fletcher, J. A. . . . . | Ottawa, Ont. . . . .             | Survey of the 26th base across ranges 1 to 17, west of the Fifth meridian, and of the 27th base across ranges 1 to 9, west of the Fifth meridian.  |
| Fletcher, W. A. . . . . | Thornton, Ont. . . . .           | Stadia surveys in tp. 26-10-2, tps. 25, 26 and 27-11-2, tps. 25, 26 and 27-12-2, tps. 24, 25, 26, 27, 27a and 28-13-2, tp. 27a-13a-2, tps. 25, 26, 27 and 27a-14-2, and tp. 27a-15-2.  |
| Fontaine, L. E. . . . . | Lévis, Que. . . . .              | Inspection of contracts Nos. 2, 9, 13, 14, 16, 17, 18 and 19 of 1914. Subdivision in tp. 77-24-5. Retracement survey in tps. 70 and 78-5-6, tps. 72 and 78-6-6, tp. 71-7-6, and tp. 72-8-6. Traverse in tp. 77-24-5, tps. 71 and 72-7-6, tp. 72-8-6, tp. 71-10-6, and tp. 70-11-6.   |
| Francis, John. . . . .  | Portage la Prairie, Man. . . . . | Contract No. 20 of 1914. Subdivision of tps. 34 and 35-8-Pr., and tps. 34, 35 and 36-9-Pr.   |
| Galletly, J. S. . . . . | Oshawa, Ont. . . . .             | Subdivision in tp. 64-14-Pr., tps. 63 and 64-15-Pr., tps. 63 and 64-16-Pr., tp. 62-18-Pr., tps. 61 and 62-19-Pr., tp. 61-24-Pr., and tp. 56-27-Pr. Survey of east outlines of tp. 64-17-Pr., and tps. 61, 63 and 64-18-Pr. Traverse in tp. 63-18-Pr., tp. 56-26-Pr., and tp. 56-27-Pr. Survey of lot in tp. 65-26-Pr. Mounding in tps. 57 and 58-26-Pr.                            |
| Gibbon, Jas. . . . .    | Vancouver, B.C. . . . .          | Subdivision in tp. 7-23-6, tps. 6 and 7-24-6, and tps. 5 and 6-25-6. Traverse in tp. 7-23-6, tps. 6 and 7-24-6, and tps. 5 and 6-25-6.   |
| Glover, A. E. . . . .   | Beaverton, Ont. . . . .          | Contract No. 5 of 1914. Subdivision of tps. 71, 72 and 73-25-5, and tps. 70, 71, 72 and 73-26-5. Survey of the east outline of tp. 69-27-5.  |
| Green, T. D. . . . .    | Ottawa, Ont. . . . .             | Subdivision of tp. 36-8-5, tp. 40-10-5, and part of tp. 35-8-5.  |



SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—Continued.

| Surveyor.               | Address.                               | Description of Work.  |
|-------------------------|--|---|
| Griffin, A. D.. . . .   | Elk Lake, Ont.... .                    | Contract No. 19 of 1914. Subdivision of tp. 91-9-4, tps. 92 and 93-10-4, tp. 88-11-4, tp. 88-12-4, and parts of tp. 90-9-4 and tp. 91-10-4. Survey of the east outline of tp. 92-9-4.   |
| Hawkins, A. H.. . . .   | Listowel, Ont. . . . .                 | Survey of the Principal meridian from the 21st to the 23rd base line and the 22nd base line across range 1, west of the Principal meridian, and range 1, east of the Principal meridian. Retracement of the Second meridian from the NE corner tp. 56-1-2 to NE. corner sec. 12, tp. 85-1-2, and of the 15th base line across ranges 1 to 21, west of the Second meridian.  |
| Heathcott, R. V.. . . . | Edmonton, Alta.. . . .                 | Contract No. 12 of 1914. Subdvision of tps. 78 and 79-14-5, tps. 78 and 79-15-5, tps. 78 and 79-16-5, the north third of tp. 77-14-5, and the north two-thirds of tp. 77-15-5. Survey of the east outlines of tps. 80-14-5, tp. 80-15-5, and tp. 80-16-5.   |
| Herriot, G. H.. . . .   | Ottawa, Ont.. . . . .                  | Survey of the 19th base line across ranges 1 to 5, the 21st base line across ranges 12 to 20, and the 22nd base line across ranges 21 and 22, east of the Principal meridian. Survey of the Second meridian east, from the 22nd to the 23rd base line, the 23rd base line across ranges 1 to 11, and the 24th base line across range 11, east of the Second meridian east. Survey of the east outline of tps. 81, 82, 83 and 84-20-E., and tps. 89, 90, 91 and 92-11, E. 2 E. |
| Holcroft. H. S.. . . .  | Toronto, Ont. . . . .                  | Subdivision of lots at Fort Churchill. Retracement of Hudson's Bay Company's reserve and Royal Northwest Mounted Police reserve at Fort Churchill.  |
| Jackson, J. E.. . . .   | Hamilton, Ont.... .                    | Contract No. 21 of 1914. Subdivision of tps. 27 and 28-3-E., tps. 25, 26 and 27-5-E., and tps. 26 and 27-6-E.   |
| Johnston, J. H.. . . .  | Edmonton, Alta.. . . .                 | Contract No. 14 of 1914. Subdivision of tps. 85, 86, 87, 88 and 89-20-5, and tps. 88 and 89-21-5.   |
| Johnston, W. J.. . . .  | S <sup>c</sup> . Catharines, Ont.. . . | Subdivision in tps. 22 and 23-1-6, tps. 22 and 23-2-6, tps. 19 and 20-5-6, tps. 18, 19, 22 and 23-6-6, tp. 22-7-6, tp. 21-12-6, and tp. 21-13-6. Traverse in tps. 22 and 23-1-6, tps. 22 and 23-2-6, tp. 19-5-6, tps. 18 and 19-6-6, tp. 23-10-6, tps. 20, 21 and 22-12-6, and tp. 21-13-6. Stadia surveys in tps. 20 and 21-29-5 and tp. 21-1-6.   |
| LeBlanc, P. M. H.. . .  | Ottawa, Ont.. . . . .                  | Subdivision of tp. 107-14-5, tp. 106-15-5, and tp. 108-17-5. Partial subdivision of tp. 108-5-5, tps. 108 and 109-11-5, tps. 108 and 109-12-5, tp. 109-13-5, tp. 104-14-5, tps. 107 and 108-15-5, tp. 108-16-5, and tp. 108-18-5. Survey of the east outlines of tps. 105 and 106-14-5, tp. 105-15-5, tp. 105-16-5.   |
| Lonergan, G. J.. . . .  | Buckingham, Que.. . .                  | Inspection of work performed by daily-paid surveyors in Manitoba, Saskatchewan, Alberta, and British Columbia.  |
| MacLeod, G. W.. . . .   | Edmonton, Alta.. . . .                 | Contract No. 2 of 1914. Subdivision of tp. 75-10-6, tp. 69-11-6, tps. 69, 70, 71 and 72-12-6, tps. 78 and 79-16-6, and the north two-thirds of tp. 74-10-6. Survey of the east outlines of tps. 77 and 80-17-6.   |
| Martyn, O. W.. . . .    | Regina, Sask.. . . . .                 | Survey of the townsite of Wymark, Sask., in tp. 13-13-3.  |



## SESSIONAL PAPER No. 25b

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to  
March 31, 1915—*Continued.*

| Surveyor.  | Address.                     | Description of Work.   |
|--|------------------------------|--|
| Matheson, H. . . . .   | Ottawa, Ont. . . . .         | Topographical survey near Jasper, in the valleys of Athabaska and Miette rivers. Survey of the corral near Jasper. Posting of a portion of the townsite of Jasper. Survey of coal lease in tp. 49-26-5.  |
| Melhuish, P. . . . .   | Vancouver, B.C. . . . .      | Subdivision in tp. 3-28-6, tp. 4-29-6, tp. 3-30-6, tp. 5-4-7, tp. 24, E.C.M. and tp. 39, W.C.M. Traverse in tp. 3-28-6, tp. 4-29-6, tp. 3-30-6, tp. 5-4-7, tp. 24, E.C.M., and tp. 39, W.C.M. Survey of addition to the townsite of Woodhaven.   |
| McKay, R. B. . . . .   | Vancouver, B.C. . . . .      | Latitude observations on the Fourth meridian, the Fifth meridian and the Sixth meridian, in northern Alberta.  |
| McKnight, J. H. . . . .  | Simcoe, Ont. . . . .         | Stadia surveys in tp. 48-10-2, tps. 31, 32 and 33-12-2 tps. 32 and 33-13-2, tps. 35, 36 and 38-14-2, tps. 35, 36, 37 and 38-15-2, tps. 31, 36, 37 and 38-16-2, tps. 34, 35, 36, 37 and 38-17-2, tps. 33, 35, 36, 37 and 38-18-2, and tps. 33, 34, 35, 36, 37 and 38-19-2.  |
| McMaster, W. A. A. . . . .   | Prince Albert, Sask. . . . . | Resurvey in tp. 46-25-2. Retracement in tp. 47-26-2, tps. 47 and 48-27-2, and tp. 47-28-2. Resurvey of part of Prince Albert settlement. Subdivision in tp. 51-1-3.  |
| Narraway, A. M. . . . .  | Ottawa, Ont. . . . .         | Survey of the 6th base line across range 10 and part of range 11, the 12th base line across ranges 2 and 3, and the 13th base line across part of range 1, west of the Principal meridian, and ranges 1, 2 and part of range 3, east of the Principal meridian. Survey of the east outlines of tps. 45, 46, 47 and 48-1-E., and of tps. 38, 39, 40, 41, 42, 43 and 44-3-E. |
| Neelands, R. . . . .   | Hamiota, Man. . . . .        | Stadia surveys in tp. 44-21-2, tp. 44-22-2, tps. 38, 39, 40, 41 and 42-25-2, tps. 38, 39, 40, 41 and 42-26-2, tps. 38, 39, 40, 41, 42, 43, 44, 45 and 45a-28-2, tps. 41, 42, 42a, 43 and 44-1-3, and tps. 52 and 53-7-3.   |
| Norrish, W. H. . . . .   | Guelph, Ont. . . . .         | Subdivision in tps. 13, 14 and 15-23-6, tp. 16-24-6, and tps. 11, 12 and 13-26-6. Traverse in tps. 14 and 15-23-6, tp. 16-24-6, tps. 11, 12 and 13-26-6, and tp. 13-27-6.  |
| (This work was originally allotted to Mr. A. E. Hunter, but on his decease it was continued by Mr. Norrish.) |                              |  |
| Palmer, P. E. . . . .  | Dorchester, N.B. . . . .     | Subdivision in tps. 69 and 70-7-Pr., tps. 68 and 69-8-Pr., tps. 67 and 68-9-Pr., tps. 65, 66 and 67-10-Pr., tps. 65 and 66-11-Pr., tp. 65-12-Pr., and tps. 64 and 65-13-Pr. Survey of island in Saskatchewan river in tp. 56-26-Pr.  |
| Pearson, H. E. . . . .   | Edmonton, Alta. . . . .      | Contract No. 15 of 1914. Subdivision of tps. 79, 80 and 81-25-4, tps. 79, 80 and 81-26-4, and tps. 79, 80 and 81-1-5. Survey of the east outlines of tps. 77 and 78-25-4, tps. 77 and 78-26-4, and tps. 77 and 78-2-5.   |
| Pierce, J. W. . . . .  | Ottawa, Ont. . . . .         | Contract No. 18 of 1914. Subdivision of tp. 87-16-4, tp. 87-17-4, the north two-thirds of tp. 87-12-4, tp. 87-13-4, tp. 87-14-4, and tp. 87-15-4, and the south third of tp. 88-13-4, tp. 88-14-4, tp. 88-15-4, and tp. 88-16-4. Survey of the east outlines of tps. 85 and 86-16-4, tps. 85 and 86-17-4, and tp. 88-18-4.   |
| Pinder, G. Z. . . . .  | Edmonton, Alta. . . . .      | Contract No. 11 of 1914. Subdivision of tp. 79-18-5, tp. 79-19-5, tps. 79 and 80-20-5, tps. 79 and 80-21-5, and part of tp. 80-19-5. Survey of the east outlines of tp. 78-19-5, and tp. 78-20-5.  |
| Ponton, A. W. . . . .  | Edmonton, Alta. . . . .      | Contract No. 6 of 1914. Subdivision of tp. 73-21-5, tps. 73 and 74-22-5, tps. 73 and 74-23-5, tp. 73-24-5, and the south two-thirds of tp. 75-22-5, and tp. 75-23-5.   |



6 GEORGE V, A. 1916

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to  
March 31, 1915—*Continued.*

| Surveyor.               | Address.                       | Description of Work.   |
|-------------------------|--------------------------------|--|
| Purser, R. C. . . . .   | Windsor, Ont. . . . .          | Subdivision in tps. 29 and 30-13-3, tps. 23, 24 and 25-15-3, and tp. 24-16-3. Retracement in tps. 14 and 15-1-Pr., tps. 14 and 15-2-Pr., tp. 15-3-Pr., tp. 9-27-Pr., tp. 21-31-Pr., tp. 23-19-2, tps. 3 and 7-20-2, tps. 5 and 7-21-2, tps. 7 and 25-22-2, tp. 6-25-2, tps. 25 and 26-27-2, tp. 20-1-3, tp. 21-9-3, tp. 39-12-3, and tp. 48-20-3. Correction survey in tp. 25-17-2, tp. 40-18-2, tp. 4-29-2, tp. 4-30-2, tp. 14-3-3, tp. 39-13-3, tp. 19-15-3, and tps. 36 and 37-20-3. Investigation in tp. 12-31-Pr. |
| Rinfret, C. . . . .     | Montreal, Que. . . . .         | Stadia surveys in tps. 3, 4, 5, 6, 8, 9 and 10-19-2, tps. 9 and 10-20-2, tps. 8, 9 and 10-21-2, tps. 8 and 9-22-2, tps. 8 and 9-23-2, tp. 8-24-2, tps. 8 and 9-25-2, tps. 7, 8, 12 and 13-26-2, tps. 7, 8, 12 and 13-27-2, tps. 7, 12 and 13-28-2, tp. 7-29-2, tps. 7 and 8-30-2, tps. 5, 6 and 7-1-3, tps. 5, 6 and 7-2-3, and tps. 5 and 6-3-3.  |
| Roberts, O. B. . . . .  | Murray Harbour, P.E.I. . . . . | Stadia surveys in tps. 42 and 43-2-4, tp. 42-3-4, tps. 39, 41 and 42-5-4, tps. 38, 39, 40, 41 and 42-6-4, tp. 30-7-4, tps. 39 and 41-8-4, tps. 35, 36, 38, 39, 40, 41 and 42-9-4, tps. 35, 38, 39, 40, 41 and 42-10-4, tps. 39, 40, 41 and 42-11-4, tps. 39, 40, 41 and 42-12-4, tps. 40, 41 and 42-13-4, tps. 37, 38, 40, 41 and 42-14-4, tps. 37, 38, 40, 41 and 42-15-4, tps. 37, 38, 41 and 42-16-4, tps. 37, 38, 39 and 42-17-4, tps. 35, 36, 38 and 39-19-4, and tp. 39-20-4.                                    |
| Segre, B. H. . . . .    | Toronto, Ont. . . . .          | Stadia surveys in tp. 20-22-2, tps. 19 and 20-23-2, tps. 19 and 20-24-2, tps. 17, 18, 19 and 20-25-2, tps. 17, 18, 19 and 20-26-2, tps. 17, 18, 19 and 20-27-2, tps. 17, 18, 19 and 20-28-2, tps. 17, 18, 19, 20 and 24-29-2, tps. 17 and 18-30-2, tps. 17, 18, 19, 20, 23, 24 and 28-1-3, tps. 20, 23 and 24-2-3, tps. 20, 22 and 23-3-3, tps. 19, 20, 21, 22 and 23-4-3, tps. 20, 21 and 22-5-3, tps. 21 and 22-6-3, tps. 19, 20, 21 and 22-7-3, and tps. 21 and 22-8-3.   |
| Saibert, F. V. . . . .  | Edmonton, Alta. . . . .        | Survey of the 26th base line from the Fourth to the Fifth meridian.  |
| Soars, H. M. R. . . . . | Edmonton, Alta. . . . .        | Stadia surveys in tp. 60-12-4, tps. 51, 52 and 53-16-4, tps. 50, 51, 52, 53 and 54-17-4, tps. 50, 51, 52, 53, 54 and 58-18-4, tps. 51, 52, 53, 54 and 57-19-4, tps. 51, 52 and 53-20-4, tps. 49, 50, 51 and 52-21-4, tps. 49, 50, 51 and 52-22-4, and tps. 48, 51, 52 and 53-23-4.   |
| Stewart, N. C. . . . .  | Ottawa, Ont. . . . .           | Subdivision in tp. 23-18-5, tps. 23 and 24-19-5, tps. 24 and 25-20-5, tps. 25 and 26-21-5, and tp. 26-22-5. Traverse in tps. 23 and 24-18-5, tps. 23 and 24-19-5, tps. 24 and 25-20-5, tps. 24, 25, 26 and 27-21-5, and tps. 26 and 27-22-5. Resurvey of lot 11, block 2, in the town of Golden in tp. 27-22-5.  |
| Stock, J. J. . . . .    | Ottawa, Ont. . . . .           | Contract No. 8 of 1914. Subdivision of tps. 77 and 78-18-5, tps. 75, 76 and 78-19-5, tp. 78-20-5, and the south two-thirds of tp. 75-20-5.   |
| Street, P. B. . . . .   | Toronto, Ont. . . . .          | Subdivision of tp. 70-6-Pr., and partial subdivision of tps. 70 and 71-5-Pr. Survey of the east outlines of tps. 69 and 72-5-Pr., tp. 69-6-Pr., and tp. 69-7-Pr.   |
| Stuart, A. G. . . . .   | Buckingham, Que. . . . .       | Survey of the 2nd base line from the Second to the Fourth meridian, the Fourth meridian from the first base line to the north boundary of township 53 and the north boundaries of tp. 48-28-3, tps. 12, 16, 20, 24, 28 and 32-29-3, tps. 12 and 16-30-3, and tps. 12, 16, 20, 24, 28, 32 and 48-1-4. Retracement for bearings of tp. 23-12-Pr., tps. 23, 31, 32 and 33-13-Pr., and part of tp. 30-13-Pr.   |



## SESSIONAL PAPER No. 25b

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Concluded.*

| Surveyor.      | Address.        | Description of Work.  |
|----------------|-----------------|---|
| Taggart, C. H. | Kamloops, B.C.  | Subdivision in tp. 20-14-6, tp. 22-16-6, tp. 23-17-6, tp. 23-18-6, tp. 24-19-6, tp. 24-20-6, tps. 21, 23 and 24-21-6, tp. 24-22-6, tp. 24-23-6, tp. 24-24-6, tps. 23 and 24-25-6, and tp. 23-26-6. Traverse in tp. 22-16-6, tp. 23-17-6, and tp. 20-18-6.   |
| Tipper, G. A.  | Brantford, Ont. | Contract No. 9 of 1914. Subdivision of tps. 77, 78, 79 and 80-25-5, and tps. 77, 78, 79 and 80-26-5.  |
| Waddell, W. H. | Edmonton, Alta. | Contract No. 7 of 1914. Subdivision of tp. 73-18-5, tps. 73 and 74-19-5, tps. 73 and 74-20-5, tp. 74-21-5, and the south two-thirds of tp. 75-21-5. Survey of the east outline of tp. 73-22-5, and part of the east outline of tp. 75-20-5.   |
| Walker, C. M.  | Guelph, Ont.    | Resurvey of Canmore townsite, blocks 1 and 2 of Banff townsite, and the north boundary section 32, tp. 24-10-5. Survey of Bankhead cemetery and additions to the townsite and villa lot section of Banff. Contour survey of the southwest slope of Tunnel mountain. Traverse and levels of roads in the vicinity of Banff, and levels and local improvements in the villa lot section of Banff. Supervision of the survey of roads in the Rocky Mountains park and Yoho park. |
| Wallace, J. N. | Calgary, Alta.  | Precise levelling along the Canadian Northern railway from Winnipeg to Swan river, from Portage la Prairie to Lake Manitoba, from Ochre river to Lake Dauphin, from Sifton Junction to Lake Winnipegosis, from Prince Albert to Big river, and from Pas towards Port Nelson, a distance of ninety-nine miles from Pas.  |
| Waugh, B. W.   | Ottawa, Ont.    | Survey of the 21st base line across ranges 10 and 11, the 22nd base line across ranges 12 to 20, and the 23rd base line across ranges 21 and 22, all east of the Principal meridian. Survey of the Second meridian east from the 23rd to the 24th base line, and the 24th base line across ranges 1 to 10, east of the Second meridian east. Survey of the east outlines of tps. 81, 82, 83 and 84-11-E., and tps. 85, 86, 87 and 88-20-E.                                    |



## APPENDIX No. 2.

SCHEDULE showing for each surveyor employed, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers, and resurvey; also the cost of the same.

| Surveyor.               | Miles<br>of<br>section. | Miles<br>of<br>outline. | Miles<br>of<br>traverse. | Miles<br>of<br>resurvey. | Total<br>mileage. | Total<br>cost. | Cost per<br>mile. | Day work<br>or<br>contract. |
|-------------------------|-------------------------|-------------------------|--------------------------|--------------------------|-------------------|----------------|-------------------|-----------------------------|
|                         |                         |                         |                          |                          |                   | \$             | \$ cts.           |                             |
| Akins, J. R. ....       |                         | 136                     |                          |                          | 136               | 20,871         | 153 46            | Day.                        |
| Aylsworth, C. F. ..     |                         |                         | 26                       | 130                      | 156               | 9,292          | 59 56             | Day.                        |
| Bennett, G. A. ....     | 10                      |                         | 110                      | 151                      | 271               | 5,435          | 20 06             | Day.                        |
| Blanchet, G. H. ....    |                         | 158                     |                          | 2                        | 160               | 22,812         | 142 58            | Day.                        |
| Boivin, E. ....         | 226                     | 78                      | 89                       |                          | 393               | 11,533         | 29 35             | Contract.                   |
| Boulton, W. J. ....     |                         |                         | 269                      | 2                        | 271               | 5,405          | 19 95             | Day.                        |
| Bowman, E. P. ....      |                         |                         | 172                      | 97                       | 269               | 4,766          | 17 72             | Day.                        |
| Brenot, L. ....         | 54                      | 89                      | 44                       | 3                        | 190               | 12,032         | 63 33             | Day.                        |
| Buchanan, J. A. ....    | 294                     | 78                      | 67                       |                          | 439               | 13,274         | 30 24             | Contract.                   |
| Calder, J. A. ....      | 122                     |                         | 51                       |                          | 173               | 9,276          | 53 62             | Day.                        |
| Christie, W. ....       | 316                     | 79                      | 32                       |                          | 427               | 13,860         | 32 45             | Day.                        |
| Coltham, G. W. ....     |                         |                         | 230                      |                          | 230               | 4,244          | 18 45             | Day.                        |
| Cote, J. M. ....        | 20                      |                         | 75                       | 330                      | 425               | 11,863         | 27 91             | Day.                        |
| Cowper, G. C. ....      | 4                       |                         | 189                      | 41                       | 234               | 4,925          | 21 04             | Day.                        |
| Cumming, A. L. ....     | 142                     | 33                      | 121                      | 21                       | 317               | 15,661         | 49 40             | Day.                        |
| Davies, T. A. ....      | 270                     | 54                      | 43                       |                          | 367               | 11,634         | 31 70             | Contract.                   |
| Day, H. S. ....         | 213                     | 120                     | 90                       |                          | 423               | 12,583         | 29 75             | Contract.                   |
| Evans, S. L. ....       | 13                      | 2                       | 52                       | 232                      | 279               | 9,968          | 35 73             | Day.                        |
| Fletcher, J. A. ....    |                         | 157                     |                          |                          | 157               | 25,276         | 160 99            | Day.                        |
| Fletcher, W. A. ....    |                         |                         | 320                      | 8                        | 328               | 4,033          | 12 30             | Day.                        |
| Francis, J. ....        | 210                     | 72                      | 20                       |                          | 302               | 8,746          | 28 96             | Contract.                   |
| Galletly, J. S. ....    | 198                     | 88                      | 77                       |                          | 363               | 12,805         | 35 28             | Day.                        |
| Gibbon, J. ....         | 48                      |                         | 55                       |                          | 103               | 10,803         | 104 88            | Day.                        |
| Glover, A. E. ....      | 294                     | 72                      | 8                        | 6                        | 380               | 12,511         | 32 92             | Contract.                   |
| Green, T. D. ....       | 111                     | 28                      | 19                       |                          | 158               | 9,743          | 61 66             | Day.                        |
| Griffin, A. D. ....     | 252                     | 113                     | 89                       |                          | 454               | 13,331         | 29 36             | Contract.                   |
| Hawkins, A. H. ....     |                         | 60                      |                          | 296                      | 356               | 38,722         | 103 15            | Day.                        |
| Heathcott, R. V. ....   | 291                     | 124                     | 77                       |                          | 492               | 14,773         | 30 03             | Contract.                   |
| Herriot, G. H. ....     |                         | 240                     |                          |                          | 240               | 37,000         | 154 17            | Day.                        |
| Jackson, J. E. ....     | 199                     | 57                      | 82                       |                          | 338               | 8,966          | 26 53             | Contract                    |
| Johnston, J. H. ....    | 293                     | 90                      | 127                      |                          | 510               | 14,416         | 28 27             | Contract                    |
| Johnston, W. J. ....    | 127                     |                         | 121                      |                          | 248               | 9,709          | 39 15             | Day                         |
| Le Blanc, P. M. H. .... | 309                     | 97                      | 38                       |                          | 444               | 28,834         | 64 94             | Day                         |
| Macleod, G. W. ....     | 363                     | 114                     | 52                       |                          | 529               | 15,636         | 29 56             | Contract                    |
| Melhuish, P. ....       | 42                      |                         | 54                       |                          | 96                | 9,086          | 94 65             | Day                         |
| McKnight, J. H. ....    |                         |                         | 209                      |                          | 209               | 4,231          | 20 24             | Day                         |
| McMaster, W. A. A. .... |                         |                         | 14                       | 76                       | 90                | 4,400          | 48 88             | Day                         |
| Narraway, A. M. ....    |                         | 99                      |                          | 1                        | 100               | 14,176         | 141 76            | Day                         |
| Neelands, R. ....       |                         |                         | 472                      |                          | 472               | 5,094          | 10 79             | Day                         |
| Norrish, W. H. ....     | 60                      |                         | 59                       |                          | 119               | 9,053          | 76 07             | Day                         |
| Palmer, P. E. ....      | 223                     | 83                      | 87                       |                          | 393               | 11,008         | 28 01             | Day                         |
| Pearson, H. E. ....     | 303                     | 138                     | 118                      |                          | 559               | 15,181         | 27 16             | Contract                    |
| Pierce, J. W. ....      | 276                     | 130                     | 102                      |                          | 508               | 15,329         | 30 17             | Contract                    |
| Pinder, G. Z. ....      | 285                     | 68                      | 15                       |                          | 368               | 11,751         | 31 93             | Contract                    |
| Ponton, A. W. ....      | 304                     | 74                      | 6                        |                          | 384               | 12,415         | 32 33             | Contract                    |
| Purser, R. C. ....      | 17                      |                         |                          | 89                       | 106               | 5,568          | 52 53             | Day                         |
| Rinfret, C. ....        |                         |                         | 283                      | 81                       | 364               | 4,471          | 12 29             | Day                         |
| Roberts, O. B. ....     |                         |                         | 177                      | 204                      | 381               | 8,138          | 21 36             | Day                         |
| Segre, B. H. ....       |                         |                         | 46                       | 34                       | 80                | 4,585          | 57 31             | Day                         |
| Seibert, F. V. ....     |                         | 146                     |                          | 1                        | 147               | 25,260         | 171 84            | Day                         |
| Soars, H. M. R. ....    |                         |                         | 258                      |                          | 258               | 4,716          | 18 21             | Day                         |
| Stewart, N. C. ....     | 90                      |                         | 305                      |                          | 395               | 9,339          | 23 65             | Day                         |
| Stock, J. J. ....       | 260                     | 42                      | 34                       |                          | 336               | 9,964          | 29 66             | Contract                    |
| Street, P. B. ....      | 71                      | 53                      | 30                       |                          | 154               | 8,378          | 54 40             | Day                         |
| Stuart, A. G. ....      |                         |                         |                          | 739                      | 739               | 8,327          | 13 13             | Day                         |
| Taggart, C. H. ....     | 111                     |                         | 12                       |                          | 123               | 10,582         | 86 03             | Day                         |
| Tipper, G. A. ....      | 401                     |                         | 38                       |                          | 439               | 13,974         | 31 83             | Contract                    |
| Waddell, W. H. ....     | 278                     | 90                      | 97                       |                          | 465               | 13,286         | 28 57             | Contract                    |
| Waugh, B. W. ....       |                         | 208                     |                          |                          | 208               | 31,209         | 150 04            | Day                         |
|                         | 7,100                   | 3,270                   | 5,141                    | 2,544                    | 18,055            | 734,253        | ....              |                             |



SESSIONAL PAPER No. 25b

APPENDIX No. 3.

SURVEYS in the Yukon Territory, returns of which have been received during the year,

LOT SURVEYS.

GROUP No. 5.

| Lot Number. | Acres. | Surveyor.       | Year of Survey. | Date of Approval. | Claimant.                 | Remarks.                |
|-------------|--------|-----------------|-----------------|-------------------|---------------------------|-------------------------|
| 147         | 48.69  | H. G. Dickson.. | 1913            | July 4, 1914      | Hamilton Yukon Mining Co. | "Canyon" mineral claim. |
| 184         | 30.57  | " ..            | 1913            | " 4, 1914         | " " "                     | "Palace" "              |
| 199         | 50.56  | " ..            | 1913            | " 4, 1914         | " " "                     | "Wentworth" "           |
| 200         | 51.26  | " ..            | 1913            | " 6, 1914         | F. J. Nicholson.....      | "Brown Cub" "           |
| 224         | 43.19  | " ..            | 1913            | " 6, 1914         | Henry Baxter.....         | "Black Cub" "           |
| 227         | 51.54  | " ..            | 1913            | Jan 18, 1915      | D. C. Campbell.....       | "Wonder" "              |

GROUP No. 6.

|     |       |                 |      |              |                                      |                       |
|-----|-------|-----------------|------|--------------|--------------------------------------|-----------------------|
| 54  | 49.03 | H. G. Dickson.. | 1913 | July 6, 1914 | Donald Ross, <i>et al.</i> ... ..    | "Acme" mineral claim. |
| 108 | 50.51 | " ..            | 1913 | " 6, 1914    | " " .....                            | "Acme" No. 2 "        |
| 124 | 29.44 | " ..            | 1913 | " 6, 1914    | " " .....                            | "Alice" "             |
| 125 | 27.08 | " ..            | 1913 | " 6, 1914    | " " .....                            | "Ross" "              |
| 126 | 51.65 | " ..            | 1913 | " 6, 1914    | " " ..                               | "Comstock" No. 2 "    |
| 127 | 46.93 | " ..            | 1913 | " 6, 1914    | " " .....                            | "Comstock" "          |
| 128 | 26.76 | " ..            | 1913 | " 6, 1914    | " " .....                            | "Silver King" "       |
| 129 | 51.61 | " ..            | 1913 | " 6, 1914    | " " .....                            | "Silver King" No. 2 " |
| 130 | 39.43 | " ..            | 1914 | .....        | Howard Cochrane, <i>et al.</i> ..... | "Rip" "               |
| 131 | 39.43 | " ..            | 1914 | .....        | " " .....                            | "Mavis" "             |
| 132 | 51.65 | " ..            | 1914 | .....        | " " .....                            | "Maid Marion" "       |
| 133 | 51.65 | " ..            | 1914 | .....        | " " .....                            | "Mountain Sheep" "    |
| 134 | 23.89 | " ..            | 1914 | .....        | " " .....                            | "Ptarmigan" "         |
| 135 | 35.48 | " ..            | 1914 | .....        | " " .....                            | "Wheaton" "           |
| 136 | 48.16 | " ..            | 1914 | .....        | " " .....                            | "Whirlwind" "         |
| 137 | 33.18 | " ..            | 1914 | .....        | " " .....                            | "Idelle" "            |

GROUP No. 10.

|    |       |                |      |              |                                |                             |
|----|-------|----------------|------|--------------|--------------------------------|-----------------------------|
| 38 | 51.65 | F. H. Kitto .. | 1913 | May 27, '14. | J. Paul Guite.....             | "North Star" mineral claim. |
| 39 | 44.36 | " .....        | 1913 | " 27, '14.   | H. Boulais & J. O. Lachapelle  | "Centre Star" "             |
| 40 | 41.88 | " .....        | 1913 | " 27, '14.   | O. Vachon, <i>et al.</i> ..... | "Alice" "                   |
| 41 | 50.15 | " .....        | 1913 | " 27, '14.   | L. A. Herdt.....               | "Jeanette" "                |

GROUP No. 12.

|   |        |                  |      |               |                   |            |
|---|--------|------------------|------|---------------|-------------------|------------|
| 6 | 138.75 | F. H. Kitto..... | 1914 | Dec. 9, '14.  | C. L. Snell ..... | Homestead. |
| 8 | 18.4   | " .....          | 1914 | Nov. 20, '14. | J. E. Binet.....  | Surface.   |
| 9 | 10.00  | " .....          | 1914 | Dec. 9, '14.  | C. L. Snell.....  | "          |



## GROUP NO. 901.

| Lot Number. | Acres. | Surveyor.     | Year of Survey. | Date of Approval. | Claimant.                   | Remarks.                                 |
|-------------|--------|---------------|-----------------|-------------------|-----------------------------|--|
| 1           | 160.00 | H. G. Dickson | 1913            | ...               | Skolai Pass Mining Co       | "Solomon Copper" mineral claim.          |
| 2           | 150.63 | "             | 1913            | ...               | Solomon Albert.             | "Solomon" Extension No. 1 mineral claim. |
| 3           | 157.96 | "             | 1913            | ...               | J. R. Slaggard.....         | "Solomon" Extension No. 2 mineral claim. |
| 4           | 91.28  | "             | 1913            | ...               | Mike Day.....               | "King Midas Copper" mineral claim.       |
| 5           | 81.35  | "             | 1913            | Feb. 22, '15.     | The N. A. T. & T. Co.....   | "Sunrise" mineral claim.                 |
| 6           | 49.97  | "             | 1913            | ...               | H. G. Blankman              | "Golden Crown" "                         |
| 7           | 41.34  | "             | 1913            | ...               | "                           | "Homestake" "                            |
| 8           | 36.51  | "             | 1913            | ...               | The Skolai Pass Mining Co.. | "Lucky Hit" "                            |
| 9           | 50.56  | "             | 1913            | ...               | "                           | "Nellie" "                               |
| 10          | 51.65  | "             | 1913            | Mar. 8, '15.      | The N. A. T. & T. Co. ....  | "Silver Fox" "                           |
| 11          | 51.65  | "             | 1913            | " 8, '15          | " "                         | "Black Fox" "                            |
| 12          | 51.65  | "             | 1913            | " 8, '15.         | " "                         | "Beaver" "                               |
| 13          | 51.65  | "             | 1913            | " 8, '15.         | " "                         | "Eldorado" "                             |
| 14          | 31.88  | "             | 1913            | ...               | H. G. Blankman.....         | "Eastern Star" "                         |
| 15          | 22.69  | "             | 1913            | Mar. 25, '15.     | The N. A. T. & T. Co. ....  | "Lost Treasure" "                        |
| 17          | 160.00 | "             | 1913            | ...               | Mike Day.....               | "Rand" "                                 |
| 18          | 51.53  | "             | 1913            | ...               | "                           | "New Zealander" "                        |
| 19          | 16.81  | "             | 1913            | ...               | The Skolai Pass Mining Co.. | "Copper Queen" fraction' mineral claim.  |
| 20          | 33.87  | "             | 1913            | Mar. 25, '15.     | The N. A. T. & T. Co. ....  | "Susie" mineral claim.                   |
| 21          | 38.56  | "             | 1913            | ...               | H. G. Blankman.....         | "Beta" "                                 |
| 22          | 46.41  | "             | 1913            | ...               | "                           | "Lyon" "                                 |
| 23          | 160.00 | "             | 1913            | ...               | "                           | "Copper Queen" mineral claim.            |
| 24          | 124.04 | "             | 1914            | ...               | J. W. McLean. ....          | "Trust" mineral claim.                   |

## GROUP NO. 1,054.

|    |       |                 |      |              |                            |                           |
|----|-------|-----------------|------|--------------|----------------------------|---------------------------|
| 1  | 50.35 | F. H. Kitto.... | 1912 | Apr. 4, '15. | J. Stewart & Wm. Catto.... | "Victoria" mineral claim. |
| 2  | 47.90 | "               | 1912 | " 4, '15     | " "                        | "Dublin King" "           |
| 3  | 40.13 | "               | 1912 | " 4, '15     | " "                        | "Happy Jack" "            |
| 4  | 46.60 | "               | 1912 | " 4, '15.    | " "                        | "Kootenay" "              |
| 5  | 46.39 | "               | 1912 | " 4, '15.    | " "                        | "Foundation" "            |
| 6  | 5.67  | "               | 1912 | " 4, '15.    | " "                        | "Shamrock" "              |
| 7  | 2.92  | "               | 1912 | " 4, '15     | " "                        | "Victoria fraction" "     |
| 8  | 41.51 | "               | 1912 | " 4, '15.    | S. C. McKim.....           | "Aien Aristenein" "       |
| 9  | 5.1   | "               | 1914 | Nov. 20, '14 | J. E. Binet                | Surface                   |
| 10 | 5.0   | "               | 1914 | " 20, '14.   | Schogrin & Chasni.....     | "                         |

## MISCELLANEOUS SURVEYS.

| Year.  | Surveyor.         | Description of Survey.  |
|--------|-------------------|---|
| 1914.. | F. H. Kitto.....  | Reference traverse between Bedrock creek and international boundary.                          |
| 1913.. | H. G. Dickson.... | Continuation Aishihik Lake Reference traverse.  |
| 1913.. | "                 | Reference traverse Bullion creek to Kluane lake.  |
| 1913.. | "                 | Base Line on Fourth of July Creek.  |
| 1913   | "                 | Section "E" (Ore Spur) British Yukon Railway Co.  |
| 1913   | "                 | Whitehorse Kluane Government Road.  |
| 1914.. | F. H. Kitto...    | Base Lines on Sixty-mile creek and tributaries, California, Twelve-mile and Five-mile creeks. |



SESSIONAL PAPER No. 25b

## APPENDIX No. 4.

## DETAILS OF THE OFFICE WORK.

|   |        |
|---|--------|
| Letters and memoranda drafted.. . . .   | 15,077 |
| Letters of instruction to surveyors.. . . .   | 321    |
| Applications for various information dealt with.. . . .   | 3,220  |
| Sketches made.. . . .   | 6,384  |
| Maps and tracings made.. . . .  | 282    |
| Areas calculated.. . . .  | 614    |
| Pages of field notes copied.. . . .   | 345    |
| Descriptions written.. . . .  | 30     |
| Progress sketches received and filed.. . . .  | 1,600  |
| Declarations of settlers received and filed.. . . .   | 229    |
| Returns of timber berths received.. . . .   | 7      |
| Plans received from surveyors.. . . .   | 1,111  |
| Field books received from surveyors.. . . .   | 889    |
| Timber reports received.. . . .   | 251    |
| Observations for magnetic declination received.. . . .  | 1,439  |
| Plans of Yukon lots received.. . . .  | 62     |
| Plans of miscellaneous Yukon surveys received.. . . .   | 7      |
| Returns of surveys examined:—   |        |
| Township subdivision.. . . .  | 842    |
| Township outline.. . . .  | 563    |
| Road plans.. . . .  | 541    |
| Railway plans.. . . .   | 85     |
| Miscellaneous Yukon surveys.. . . .   | 7      |
| Yukon lots.. . . .  | 62     |
| Mineral claims.. . . .  | 91     |
| Timber berths.. . . .   | 7      |
| Correction and other miscellaneous surveys.. . . .  | 217    |
| Preliminary township plans prepared.. . . .   | 382    |
| Township plans compiled.. . . .   | 905    |
| Townsite settlement and other plans compiled.. . . .  | 39     |
| Proofs of plans examined.. . . .  | 130    |
| Township plans printed.. . . .  | 704    |
| Township plans reprinted.. . . .  | 244    |
| Townsite and settlement plans printed.. . . .   | 13     |
| Sectional maps (3 miles to 1 inch):—  |        |
| Revised and reprinted.. . . .   | 15     |
| Reprinted but not revised.. . . .   | 8      |
| New maps compiled and printed.. . . .   | 14     |
| Sectional maps (6 miles to 1 inch):—  |        |
| Reprinted.. . . .   | 14     |
| New maps printed.. . . .  | 12     |
| Files received and returned.. . . .   | 1,968  |
| Books received from Record Office and used in connection with office work.. . . .                                   | 5,657  |
| Books returned to Record Office.. . . .   | 4,167  |
| Plans other than printed township plans received from Record Office and used in connection with office work.. . . . | 1,046  |
| Plans returned to Record Office.. . . .   | 775    |
| Volumes of plans received from Record Office and used in connection with office work.. . . .                        | 142    |
| Volumes of plans returned to Record Office.. . . .  | 75     |
| Books sent to Record Office to be placed on record.. . . .  | 780    |
| Plans other than township plans sent to Record Office to be placed on record.. . . .                                | 180    |



## APPENDIX No. 5.

SECTIONAL MAPS, of which new editions have been issued.

Scale, 3 miles to 1-inch.

| No. | Name.                | No. | Name.        |
|-----|----------------------|-----|--------------|
| 20  | Souris.              | 372 | Minago.      |
| 66  | Medicine Hat.        | 412 | Wapiti.      |
| 113 | Spillimacheen.       | 413 | Iosegun.     |
| 114 | Calgary.             | 414 | Saulteux.    |
| 162 | Seymour.             | 415 | Tawatinaw.   |
| 172 | Farford.             | 416 | La Biche.    |
| 173 | Washow.              | 423 | Sipiwesk.    |
| 213 | Athabaska.           | 442 | Wekusko.     |
| 263 | Jasper.              | 462 | Dunvegan.    |
| 314 | St. Ann.             | 464 | Giroux.      |
| 316 | Vermilion.           | 465 | Pelican.     |
| 317 | Fort Pitt.           | 512 | Montagneuse. |
| 318 | Shell River.         | 513 | Heart River. |
| 319 | Prince Albert North. | 515 | Wabiskaw.    |
| 321 | Cedar Lake.          | 563 | Notikewin.   |
| 364 | Fort Assiniboine.    | 566 | McKay.       |
| 367 | Meadow Lake.         | 663 | Mustus.      |
| 368 | Green Lake.          | 664 | Mikkwa.      |
| 371 | Cowan River.         |     |              |

Scale, 6 miles to 1-inch.

|     |                     |     |              |
|-----|---------------------|-----|--------------|
| 20  | Souris.             | 412 | Wapiti.      |
| 113 | Spillimacheen.      | 413 | Iosegun.     |
| 173 | Washow.             | 416 | La Biche.    |
| 263 | Jasper.             | 462 | Dunvegan.    |
| 314 | St. Ann.            | 464 | Giroux.      |
| 316 | Vermilion.          | 465 | Pelican.     |
| 317 | Fort Pitt.          | 512 | Montagneuse. |
| 318 | Shell River.        | 513 | Heart River. |
| 319 | Prince Alter North. | 515 | Wabiskaw.    |
| 321 | Cedar Lake.         | 563 | Notikewin.   |
| 367 | Meadow Lake.        | 566 | McKay.       |
| 368 | Green Lake.         | 663 | Mustus.      |
| 371 | Cowan River.        | 664 | Mikkwa.      |



SESSIONAL PAPER No. 25b

APPENDIX No. 6.  
Work executed in the Photographic Office.

|                           | 3½ x 3½ | 3½ x 5½ | 5 x 7 | 8 x 10 | 10 x 12 | 11 x 14 | 15 x 18 | 18 x 20 | 20 x 24 | 24 x 32 | 25 x 35 | 30 x 36 | 36 x 42 | 42 x 48 | Total. |
|---------------------------|---------|---------|-------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| Dry plates and films..... | .....   | 18      | 657   | .....  | .....   | 64      | .....   | .....   | 59      | 63      | .....   | 15      | .....   | .....   | 739    |
| Bromide prints.....       | .....   | 15      | 4     | 87     | 43      | 1,938   | 284     | 165     | .....   | .....   | .....   | .....   | 41      | 65      | 2,719  |
| Solio prints.....         | .....   | .....   | 139   | 51     | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | 190    |
| Velox prints.....         | 50      | 218     | 5,547 | 1,030  | .....   | 101     | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | 6,946  |
| Vandyke prints.....       | .....   | .....   | 47    | 6      | .....   | 15      | 24      | 49      | 44      | 167     | .....   | 47      | 34      | 45      | 478    |
| Blue-prints.....          | .....   | .....   | 2     | 27     | 21      | 166     | 186     | 186     | 205     | 274     | .....   | 279     | 120     | 202     | 1,668  |
| Lantern slides.....       | 23      | .....   | ..... | .....  | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | .....   | 23     |
| Photographs mounted.....  | .....   | 6       | 2,194 | .....  | .....   | 26      | 75      | .....   | 1       | 12      | .....   | .....   | .....   | .....   | 2,314  |
| Wet plate negatives.....  | .....   | .....   | ..... | 101    | .....   | 296     | 1,310   | 258     | 73      | 100     | .....   | .....   | .....   | .....   | 2,138  |
| Photo-litho plates.....   | .....   | .....   | ..... | .....  | .....   | .....   | .....   | 105     | 11      | .....   | 6       | 475     | .....   | .....   | 597    |
|                           | 73      | 237     | 8,590 | 1,362  | 64      | 2,606   | 1,879   | 703     | 393     | 616     | 6       | 816     | 195     | 312     | 17,812 |



APPENDIX No. 7.

Work executed in the Lithographic Office.

|                | MAPS. |         |                   | TOWNSHIP PLANS. |         |                   | FORMS. |         |                   |
|----------------|-------|---------|-------------------|-----------------|---------|-------------------|--------|---------|-------------------|
|                | No.   | Copies. | Impres-<br>sions. | No.             | Copies. | Impres-<br>sions. | No.    | Copies. | Impres-<br>sions. |
| 1914.          |       |         |                   |                 |         |                   |        |         |                   |
| April.....     | 11    | 1,881   | 3,606             | 133             | 26,100  | 41,000            | 9      | 3,920   | 4,370             |
| May.....       | 20    | 54,673  | 186,998           | 53              | 10,600  | 10,800            | 30     | 12,400  | 12,400            |
| June.....      | 21    | 6,918   | 18,379            | 85              | 16,600  | 21,200            | 8      | 2,510   | 2,510             |
| July.....      | 41    | 13,600  | 32,650            | 94              | 21,200  | 33,600            | 4      | 720     | 720               |
| August.....    | 15    | 3,737   | 5,285             | 142             | 28,400  | 48,800            | 4      | 1,400   | 1,500             |
| September..... | 19    | 8,206   | 17,206            | 43              | 8,600   | 8,800             | 4      | 2,650   | 2,650             |
| October.....   | 5     | 6,725   | 14,450            | 68              | 13,600  | 16,000            | 9      | 16,200  | 16,200            |
| November.....  | 10    | 3,275   | 7,450             | 112             | 22,400  | 36,800            | 1      | 200     | 400               |
| December.....  |       |         |                   | 70              | 13,600  | 13,600            | 4      | 775     | 775               |
| 1915.          |       |         |                   |                 |         |                   |        |         |                   |
| January.....   | 7     | 2,015   | 6,015             |                 |         |                   | 8      | 1,950   | 1,950             |
| February.....  | 22    | 29,000  | 103,400           | 55              | 11,000  | 11,000            | 7      | 26,060  | 26,060            |
| March.....     | 20    | 6,275   | 6,370             | 192             | 38,400  | 70,800            | 16     | 12,500  | 12,500            |
| Total.....     | 189   | 136,105 | 401,809           | 1047            | 210,500 | 311,800           | 104    | 81,285  | 82,035            |

RECAPITULATION.

|                     | No.   | Copies. | Impressions. | Cost.    |
|---------------------|-------|---------|--------------|----------|
|                     |       |         |              | \$ cts.  |
| Maps.....           | 189   | 136,105 | 401,809      | 3,616.29 |
| Township plans..... | 1,047 | 210,500 | 311,800      | 2,800.00 |
| Forms.....          | 104   | 81,285  | 82,035       | 738.32   |
| Grand total.....    | 1,340 | 427,890 | 795,644      | 7,154.61 |



SESSIONAL PAPER No. 25b

## APPENDIX No. 8.

OFFICE STAFF of the Topographical Surveys Branch at Ottawa, as on April 1, 1915, with the name, classification, duties of office and salary of each. (Metcalf street, corner of Slater.)

| NAME.                            | CLASSIFICATION. |               | Duties of Office.             | Salary. |
|----------------------------------|-----------------|---------------|-------------------------------|---------|
|                                  | Division.       | Sub-division. |                               |         |
|                                  |                 |               |                               | \$      |
| Deville, E., D.T.S., LL.D. ....  | 1               | A             | Surveyor General.....         | 4,000   |
| Shanks, T., B.A.Sc., D.L.S. .... | 1               | A             | Asst. Surveyor General .....  | 2,900   |
|                                  | Correspondence. |               |                               |         |
| Brady, M. ....                   | 1               | B             | Secretary ..                  | 2,700   |
| Cullen, M. J. ....               | 3               | A             | Clerk.....                    | 1,200   |
| Williams, E. R. ....             | 3               | A             | " .....                       | 1,100   |
| Addison, W. G. ....              | 3               | A             | Stenographer.....             | 1,000   |
| Renault, J. F. ....              | 3               | B             | " .....                       | 800     |
| Laforce, D. ....                 | 3               | B             | " .....                       | 500     |
| Pegg, A. ....                    |                 |               | Messenger.....                | 800     |
| O'Meara, M. T. ....              |                 |               | " .....                       | 700     |
|                                  | Accounts.       |               |                               |         |
| Hunter, R. H. ....               | 2               | A             | Accountant .....              | 2,100   |
| Lemay, A. ....                   | 2               | A             | Asst. accountant.....         | 1,700   |
| McPhail, N. R. ....              | 2               | B             | " .....                       | 1,050   |
|                                  | Field work.     |               |                               |         |
| Brown, T. E., B.A. ....          | 1               | B             | Supervisor of field work..... | 2,800   |

## DIVISION I.

## Survey Instructions and General Information.

|   |   |   |                          |       |
|---|---|---|--------------------------|-------|
| Barber, H. G., Grad. S.P.S., D.L.S. ....  | 1 | B | Chief of division.....   | 2,300 |
| Rice, F. W., Grad. School of Min., D.L.S. | 2 | A | Technical clerk.....     | 2,050 |
| MacIlquham, W. L., B.Sc., D.L.S. ....     | 2 | A | " .....                  | 2,050 |
| Peaker, W. J., Grad. S.P.S. ....          | 2 | A | " .....                  | 1,750 |
| Carroll, M. J., Grad. S.P.S. ....         | 2 | A | " .....                  | 1,750 |
| Rochon, E. C. ....                        | 2 | A | " .....                  | 1,700 |
| McRae, A. D., B.A., B.Sc. ....            | 2 | A | Supply clerk ..          | 1,700 |
| Grant, A. W., B.A. ....                   | 2 | A | Editor .....             | 1,700 |
| Hayward, H. E., B.Sc. ....                | 2 | A | Registration clerk ..... | 1,650 |
| Macmillan, J. P., B.E. ....               | 2 | B | Technical clerk.....     | 1,450 |
| Gagnon, J. N. H., B.A.S. ....             | 2 | B | " .....                  | 1,200 |
| Armstrong, W. B., B.Sc. ....              | 2 | B | " .....                  | 1,350 |
| Nevins, L. A., B.A. ....                  | 2 | B | " .....                  | 1,350 |
| McDonald, J. F., B.A. ....                | 2 | B | Registration clerk.....  | 1,350 |
| Quinlan, L. J., B.A.Sc. ....              | 2 | B | Technical clerk.....     | 1,300 |
| Gallaher, O. G., B.Sc. ....               | 2 | B | " .....                  | 1,250 |
| Miller, A. H., B.A. ....                  | 2 | B | " .....                  | 1,250 |
| Morgan, A. L., B.Sc. ....                 | 2 | B | " .....                  | 1,250 |
| Campbell, D. H., B.A.Sc. ....             | 2 | B | " .....                  | 1,200 |
| Thompson, N. A., B.Sc. ....               | 3 | B | " .....                  | 1,200 |
| Burkholder, E. L. ....                    | 3 | A | Clerk.....               | 1,100 |



## APPENDIX No. 8—Continued.

## DIVISION II.

## Examination of Survey Returns and Compilation of Plans.

| Name.                                     | CLASSIFICATION. |               | Duties of Office.       | Salary. |
|---|-----------------|---------------|-------------------------|---------|
|   | Division        | Sub-division. |                         |         |
|   |                 |               |                         | \$      |
| Nash, T. S., Grad. S.P.S., D.L.S.....     | 1               | B             | Chief of division ..... | 2,800   |
| Dennis, E. M., B. Sc., D.L.S.....         | 1               | B             | Surveys examiner .....  | 2,200   |
| Hill, S. N., Grad. S.P.S., C.E.....       | 1               | B             | " .....                 | 2,200   |
| Elder, A. J., Grad. S.P.S., D.L.S.....    | 2               | A             | " .....                 | 2,050   |
| Genest, P. F. X., Q.L.S.....              | 2               | A             | " .....                 | 2,050   |
| McClennan, W. D.....                      | 2               | A             | " .....                 | 1,750   |
| Roger, A., O.L.S., D.L.S.....             | 2               | A             | " .....                 | 1,750   |
| Sutherland, H. E., B.Sc.....              | 2               | A             | " .....                 | 1,700   |
| Ault, H. W.....                           | 2               | A             | " .....                 | 1,700   |
| Bray, R. P.....                           | 2               | A             | " .....                 | 1,700   |
| Spreckley, R. O.....                      | 2               | A             | " .....                 | 1,650   |
| Goodday, Leonard.....                     | 2               | B             | " .....                 | 1,550   |
| Harrison, E. W.....                       | 2               | B             | " .....                 | 1,450   |
| Lytle, W. J.....                          | 2               | B             | Recorder .....          | 1,200   |
| LaBeree, E. E.....                        | 2               | B             | Surveys examiner. ....  | 1,200   |
| Jones, G. S., Grad. S.P.S., O.L.S., D.L.S | 2               | B             | " .....                 | 1,200   |
| Bradley, J. D.....                        | 2               | B             | " .....                 | 1,200   |
| Kirwan, G. L., B.A.Sc.....                | 2               | B             | " .....                 | 1,300   |
| Callander, R., B.Sc.....                  | 2               | B             | " .....                 | 1,250   |
| Cram, R. M., B.Sc.....                    | 2               | B             | " .....                 | 1,250   |
| Timbrell, E. G., B.Sc.....                | 2               | B             | " .....                 | 1,250   |
| Fraser, A., B.A.Sc.....                   | 2               | B             | " .....                 | 1,200   |
| DesLauriers, J.....                       | 2               | B             | " .....                 | 1,600   |
| Macdonald, J. A.....                      | 3               | B             | Clerk. ....             | 800     |

## DIVISION III.

## Drafting and Printing, (Imperial Building, Queen street.)

|                                |   |   |                         |       |
|--------------------------------|---|---|-------------------------|-------|
| Engler, Carl, B.A., D.L.S.. .. | 1 | B | Chief of division ..... | 2,400 |
| May, J. E. ....                | 2 | A | Draughtsman.....        | 2,050 |
| Moule, W. J.....               | 2 | B | Litho-designer.....     | 1,600 |
| Helmer, J. D.....              | 2 | B | Draughtsman .....       | 1,250 |
| Dawson, R. J.....              | 2 | B | Stamper .....           | 1,250 |
| Archambault, E.....            | 2 | B | Draughtsman & stamper.  | 1,250 |
| Birchall, W. A.....            | 2 | B | Draughtsman .....       | 1,250 |
| Hall, J.....                   | 2 | B | " .....                 | 1,200 |
| Watters, James.....            | 3 | A | Printer .....           | 1,200 |
| Brown, A.....                  | 3 | A | Stamper .....           | 1,100 |
| Ebbs, E. J.....                | 3 | A | " .....                 | 1,100 |
| Baril, C.....                  | 3 | A | Clerk .....             | 950   |

## DIVISION IV.

## British Columbia Surveys, (Imperial Building, Queen street.)

|                                  |   |   |                         |       |
|----------------------------------|---|---|-------------------------|-------|
| Rowan-Legg, E. L.....            | 2 | A | Chief of division ..... | 2,100 |
| Gillmore, E. T. B., Grad. R.M.C. | 2 | A | Surveys examiner .....  | 2,100 |
| Morley, R. W.....                | 2 | A | " .....                 | 2,050 |
| Wilson, E. E. D., B.Sc.....      | 2 | A | " .....                 | 1,800 |
| Harris, K. D.....                | 2 | A | " .....                 | 1,650 |



SESSIONAL PAPER No. 25b

APPENDIX No. 8—Continued.

DIVISION V.

Mapping, (Imperial Building, Queen street.)

| Name.  | CLASSIFICATION. |               | Duties of Office.           | Salary. |
|--|-----------------|---------------|-----------------------------|---------|
|  | Division        | Sub-division. |                             |         |
|  |                 |               |                             | \$      |
| Smith, J. . . . .                              | 1               | B             | Chief of division . . . . . | 2,800   |
| Henderson, F. D., Grad. S.P.S., D.L.S. . . . . | 1               | B             | Technical clerk. . . . .    | 2,200   |
| Bégin, P. A. . . . .                           | 2               | A             | Draughtsman. . . . .        | 2,100   |
| Blanchet, A. E. . . . .                        | 2               | A             | " . . . . .                 | 1,650   |
| D'Orsonnens, A. . . . .                        | 2               | A             | " . . . . .                 | 1,750   |
| Flindt, A. H. . . . .                          | 2               | A             | " . . . . .                 | 1,850   |
| Davies, T. E. S. . . . .                       | 2               | A             | Recorder. . . . .           | 1,650   |
| Purdy, W. A. . . . .                           | 2               | A             | Draughtsman. . . . .        | 1,650   |
| Bergin, W. . . . .                             | 2               | B             | " . . . . .                 | 1,250   |
| Blanchard, J. F. . . . .                       | 2               | B             | Technical clerk. . . . .    | 1,250   |
| Colquhoun, G. A., B.Sc. . . . .                | 2               | B             | " " . . . . .               | 1,350   |
| Davy, E. . . . .                               | 2               | B             | Draughtsman. . . . .        | 1,550   |
| Fitzgerald, C.C., B.Sc. . . . .                | 2               | B             | Technical clerk. . . . .    | 1,200   |
| Hawes, J. H. B.A. Sc . . . . .                 | 2               | B             | " " . . . . .               | 1,200   |
| Howie, Jas. . . . .                            | 2               | B.            | Draughtsman. . . . .        | 1,200   |
| Perrin, V. . . . .                             | 2               | B             | " . . . . .                 | 1,600   |
| Squire, R. L., B.Sc. . . . .                   | 2               | B             | Technical clerk. . . . .    | 1,250   |
| Villeneuve, E. . . . .                         | 2               | B             | Draughtsman. . . . .        | 1,250   |

DIVISION VI.

Special Surveys, (Imperial Building, Queen street.)

|  |   |   |  |       |
|--|---|---|--|-------|
| Dodge, G. B., D.L.S. . . . .                 | 1 | B | Chief of division and Supt. Surveys Laboratory . . . . . | 2,800 |
| Watt, G. H. Grad. S.P.S., D.L.S. . . . .     | 2 | A | Computer. . . . .  | 2,050 |
| Way, W.C., M.Sc. . . . .                     | 2 | A | Asst. Supt. Sur. Laboratory . . . . .                    | 1,700 |
| Milliken, J. B., B.A., B.Sc., D.L.S. . . . . | 2 | A | Examiner of baseline survey . . . . .                    | 1,650 |
| Parry, H., B. Eng. D.L.S. . . . .            | 2 | A | Mathematician. . . . .                                   | 1,650 |
| Cannell, H. W., D.L.S. . . . .               | 2 | A | Computer. . . . .  | 1,600 |
| Doxsee, W. W. M.A. . . . .                   | 2 | B | Laboratory assistant. . . . .                            | 1,200 |
| Dunlop, J. H., B.Sc. . . . .                 | 2 | B | Computer. . . . .  | 1,200 |
| Field, R. H. . . . .                         | 2 | B | Laboratory assistant. . . . .                            | 1,200 |
| Herbert, W. H., B.Sc. . . . .                | 2 | B | Computer . . . . .                                       | 1,350 |
| Hughson, W. G., B.Sc. . . . .                | 2 | B | Laboratory assistant. . . . .                            | 1,300 |
| Jeffrey, Miss G., B.A. . . . .               | 2 | B | Computer. . . . .  | 1,200 |
| Linford, W. J. . . . .                       | 2 | B | Laboratory assistant. . . . .                            | 1,200 |
| Roe, B. J. . . . .                           | 2 | B | Computer. . . . .  | 1,300 |
| Ross, R. C., B.Sc. . . . .                   | 2 | B | " . . . . .  | 1,350 |
| Lynch, F. J. . . . .                         | 3 | B | Stenographer. . . . .                                    | 800   |
| Watson, J. W. . . . .                        | 3 | B | Clerk . . . . .  | 800   |
| Pick, A. C. . . . .                          |   |   | Messenger. . . . .                                       | 700   |

Chief Inspector of Surveys Office, (130 Wellington Street.)

|                                |   |   |                           |       |
|--------------------------------|---|---|---------------------------|-------|
| Hubbell, E. W., D.L.S. . . . . | 1 | B | Chief Inspector . . . . . | 2,800 |
| Sylvain, John. . . . .         | 2 | B | Assistant. . . . .        | 1,850 |
| Stalker, Miss M. W. . . . .    | 3 | A | Stenographer. . . . .     | 1,100 |

Board of Examiners for D.L.S.

|                                   |   |   |                       |       |
|-----------------------------------|---|---|-----------------------|-------|
| Côté, J. A., Grad. R.M.C. . . . . | 2 | A | Secretary . . . . .   | 1,800 |
| Nolan, Miss A. A. . . . .         | 3 | B | Stenographer. . . . . | 550   |



APPENDIX No. 8—*Concluded.*

Geographic Board, (Woods Building, Slater street.)

| Name.                                 | CLASSIFICATION. |              | Duties of Office. | Salary. |
|---------------------------------------|-----------------|--------------|-------------------|---------|
|                                       | Division        | Sub-division |                   |         |
| Whitcher, A. H., F.R.G.S., D.L.S..... | 2               | A            | Secretary. ....   | 2,100   |

Photographic Office, (Metcalf street, corner Slater street.)

|                        |   |   |                          |       |
|------------------------|---|---|--------------------------|-------|
| Carruthers, H. K.....  | 2 | A | Process photographer.... | 2,050 |
| Woodruff, John.....    | 2 | A | Chief " .....            | 2,050 |
| Owen, E. R .....       | 2 | B | Asst. photographer.....  | 850   |
| Collins, G. H. A ..... | 2 | B | Photographer .....       | 1,050 |
| Whitecomb, H. E.....   | 3 | A | " .....                  | 1,200 |
| Morgan, W. E.....      | 3 | A | " .....                  | 1,200 |
| Kilmartin, A .....     | 3 | A | Asst. photograpber.....  | 1,100 |
| Quimet, E. G.....      | 3 | B | " " .....                | 1,000 |
| Bourbeau, J. A.....    |   |   | " " .....                | 700   |

Lithographic Office, (Imperial Building, Queen street.)

| Name.                   | Occupation.              | Salary.           |
|-------------------------|--------------------------|-------------------|
| Moody, A.....           | Foreman... ..            | \$28 00 per week. |
| Burnett, E .....        | Lithographer .....       | 25 00 "           |
| Thicke, C. R.....       | " .....                  | 24 00 "           |
| Deslauriers, J. H ..... | Transferrer.....         | 21 00 "           |
| Bergin, J.....          | Printer .....            | 22 00 "           |
| Thicke, H. S.....       | " .....                  | 21 00 "           |
| Boyle, S .....          | Stone polisher.....      | 16 00 "           |
| Gagnon, J .....         | Press feeder.....        | 13 00 "           |
| Kane, P. ....           | " .....                  | 11 50 "           |
| Easton, R. M....        | Printer .....            | 21 00 "           |
| Hare, E. H.....         | Asst. photographer.....  | 16 00 "           |
| Gordon, W.....          | Litho-transferrer.....   | 21 00 "           |
| Perkins, I. J.....      | Asst. phttographer ..... | 10 00 "           |



SESSIONAL PAPER No. 25b

## APPENDIX No. 9.

List of Dominion Land Surveyors who are in possession of Standard Measures.

| Name.                           | Address.                        | Date of Birth. | Date of Appointment or of Commission. | Remarks.  |
|---------------------------------|---------------------------------|----------------|---------------------------------------|---|
| Akins, James Robert.....        | Ottawa, Ont.....                | Sept. 2, '76   | Mar. 14, '10                          |   |
| Allison, Calvin Bruce .....     | South Woodslee, Ont.            | June 16, '84   | Mar. 28, '10                          | O.L.S.  |
| Ashton, Arthur Ward.....        | Not known.....                  | Nov. 5, '80    | May 29, '08                           | B.C.L.S.  |
| Austin George Frederick.....    | Not known.....                  |                | April 14, '72                         |   |
| Aylen, John .....               | North Bay, Ont.....             |                | May 29, '85                           |   |
| Aylsworth, Charles Fraser.....  | Madoc, Ont.....                 | April 21, '62  | May 13, '86                           | O.L.S.  |
| Baker, James Clarence.....      | Vermilion, Alta.....            | May 12, '78    | May 18, '06                           | A.L.S.  |
| Baker, Mason Hermon.....        | St. Thomas, Ont....             | July 9, '84    | Aug. 6, '08                           | O.L.S.  |
| Bartlett, Ernest.....           | Medicine Hat, Alta.             | '83            | Jan. 16, '11                          | A.L.S.  |
| Bayne, George A. ....           | Winnipeg, Man.....              | Oct. 25, '50   | April 14, '72                         | M.L.S.  |
| Beatty, David.....              | Parry Sound, Ont ..             | Dec. 22, '42   | April 14, '72                         | O.L.S.  |
| Beatty, Frank Weldon.....       | Pembroke, Ont.....              | July 12, '92   | May 18, '14                           |   |
| Begg, William Arthur.....       | Hamilton, Ont.....              | July 15, '82   | June 8, '09                           | S.L.S.  |
| Belanger, Phidime Roch Arthur   | Ottawa, Ont.....                | Mar. 5, '53    | May 17, '80                           | Inspector of Surveys,<br>Topographical Surveys<br>Branch, Dept. of the<br>Interior. |
| Belleau, Joseph Alphonse ....   | Ottawa, Ont .....               | Sept. 30, '56  | May 15, '83                           | Land Patents Branch,<br>Department of Interior.                                     |
| Belyea, Albert Palmer Cor y...  | Edmonton, Alta.....             |                | July 14, '09                          | A.L.S.  |
| Bennister, George Bartlett..... | Winnipeg, Man.....              |                | June 11, '78                          | M.L.S. Engineering Dept.<br>C.N.R.  |
| Bennett, George Arthur.....     | Ottawa, Ont.....                | May 18, '86    | Aug. 25, '10                          | A.L.S.  |
| Berry, Edward Wilson.....       | Seaforth, Ont....               | Aug. 26, '81   | May 18, '11                           |   |
| Bigger, Charles Albert....      | Ottawa, Ont.....                | Aug. 15, '53   | Mar. 30, '82                          | B.C.L.S., O.L.S., Assist-<br>ant Superintendent<br>Geodetic Surveys.                |
| Bingham, Edwin Ralph.....       | Fort William, Ont..             | '78            | Oct. 25, '06                          | O.L.S.  |
| Bingham, Harold Carr.....       | Moosejaw, Sask....              | Aug. 7, '88    | Mar. 13, '14                          | S.L.S.  |
| Blanchet, Guy Houghton. ....    | Ottawa, Ont.....                | Feb. 12, '84   | Mar. 10, '10                          |   |
| Boivin, Elzear .....            | Edmonton, Alta ...              | June 13, '57   | Nov. 13, '83                          |   |
| Boswell, Elias John.....        | Montreal, Que ..                | Sept. 26, '70  | Mar. 18, '03                          | O.L.S., M.L.S.  |
| Boulton, William James.....     | Wallaceburg, Ont....            | Oct. 2, '84    | Mar. 7, '12                           |   |
| Bourgeault, Armand.....         | St. Jean Port Joli,<br>Que..... | Feb. 23, '58   | Mar. 29, '83                          | Q.L.S.  |
| Bourgault, Charles Eugene.....  | Lauzon, Levis, Que.             | Sept. 6, '61   | Feb. 21, '88                          |   |
| Bourget, Charles Arthur.. ....  | Lauzon, Que.....                | Aug. 26, '51   | May 14, '84                           | Q.L.S.  |
| Bowman, Edgar Peterson ..       | West Montrose, Ont.             | Sept. 29, '83  | Sept. 26, '07                         | O.L.S.  |
| Bowman, Herbert Joseph .....    | Berlin, Ont.....                | June 18, '65   | Feb. 16, '88                          | O.L.S.  |
| Brabazon, Alfred James ..       | Ottawa, Ont.....                |                | May 13, '82                           | Boundary Surveys, Dept.<br>of the Interior.   |
| Bray, Samuel .....              | Ottawa, Ont .....               | Nov. 5, '46    | Nov. 14, '83                          | O.L.S., Chief Surveyor,<br>Dept. of Indian Affairs.                                 |
| Bray, Lennox Thomas.....        | Edmonton, Alta.....             | Mar. 14, '77   | Feb. 18, '03                          | O.L.S., A.L.S.  |
| Brenot, Lucien .....            | Ottawa, Ont.....                | Aug. 31, '87   | Mar. 18, '10                          |   |
| Bridgland, Morrison Parsons...  | Calgary, Alta.....              | Dec. 20, '78   | Mar. 10, '05                          | A.L.S.  |
| Broughton, George Henry.....    | Penticton, B.C.....             | Aug. 12, '86   | June 3, '09                           | B.C.L.S.  |
| Brown, Charles Dudley.....      | Winnipeg, Man.....              | Feb. 25, '83   | April 4, '10                          | A.L.S., S.L.S.  |
| Brown, Edgar Carl.....          | Winnipeg, Man....               | Nov. 28, '86   | May 23, '11                           | A.L.S., S.L.S.  |
| Brown, Thomas Wood.....         | Saskatoon, Sask....             | Nov. 10, '79   | June 21, '09                          | A.L.S., S.L.S.  |
| Brownlee, James Harrison....    | Vancouver, B. C....             | Mar. 22, '56   | April 15, '87                         | M.L.S., B.C.L.S., Direc-<br>tor of Surveys, Yukon<br>Territory.                     |
| Buchanan, John Alexander....    | Edmonton, Alta.....             | Mar. 4, '87    | May 17, '12                           | A.L.S.  |
| Burd, James Henry.....          | Weyburn, Sask.....              | Sept. 7, '71   | May 18, '11                           | O.L.S., S.L.S.  |
| Burgess, Edward LeRoy. ....     | Kamloops, B.C.....              | May 5, '78     | Feb. 23, '05                          | O.L.S.  |
| Burnet, Hugh.....               | Victoria, B.C.....              |                | June 22, '85                          | O.L.S., B.C.L.S.  |
| Burwash, Nathaniel Alfred.....  | Toronto, Ont....                | Sept. 28, '79  | Mar. 6, '07                           | O.L.S.  |
| Burwell, Herbert Mahlon.....    | Vancouver, B.C....              | Oct. 23, '63   | Feb. 17, '87                          | B.C.L.S.  |
| Calder, John Alexander.....     | Lytton, B.C.....                | June 2, '86    | May 21, '12                           |   |
| Cameron, Charles Scott.....     | Beaverton, Ont. ....            | Dec. 6, '84    | Mar. 15, '13                          |   |
| Campbell, Alan John.....        | Sidney, B.C. ....               | Oct. 1, '82    | April 13, '09                         | B.C.L.S., A.L.S.  |
| Campbell, Alexander Stewart..   | Kingston, Ont.....              | Mar. 7, '80    | Mar. 6, '09                           | O.L.S.  |



## APPENDIX No. 9—Continued.

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

| Name.                            | Address.            | Date of Birth. | Date of Appointment or of Commission. | Remarks.  |
|----------------------------------|---------------------|----------------|---------------------------------------|---|
| Carbert, Joseph Alfred.....      | Medicine Hat, Alta. | Feb. 4, '56    | May 12, '80                           | O.L.S., A.L.S., District Engineer and Surveyor, Dept. of Public Works, Alberta. |
| Carpenter Henry Stanley.....     | Regina, Sask.....   | Feb. 8, '74    | Feb. 20, '01                          | O.L.S., S.L.S., Department of Public Works.                                     |
| Carroll, Cyrus.....              | Regina, Sask.....   | Dec. 6, '34    | April 14, '72                         | O.L.S., S.L.S.  |
| Carson, John Alton.....          | Vancouver, B.C....  | Aug. 10, '89   | May 18, '14                           |   |
| Carson, Percy Alexander.....     | Calgary, Alta.....  | Dec. 25, '77   | Feb. 22, '06                          |   |
| Carthew, William Morden.....     | Edmonton, Alta....  | Oct. 19, '86   | Mar. 29, '10                          | A.L.S.  |
| Carthew, John Trewalla.....      | Edmonton, Alta....  | Feb. 15, '91   | Mar. 15, '13                          |   |
| Cautley, Reginald Hutton.....    | Edmonton, Alta....  | Dec. 6, '79    | May 1, '05                            | A.L.S.  |
| Cautley, Richard William....     | Edmonton, Alta....  | Aug. 3, '73    | Sept. 2, '96                          | A.L.S.  |
| Cavana, Allan George.....        | Orillia, Ont.....   | Jan. 22, '58   | Nov. 16, '76                          | O.L.S.  |
| Charlesworth, Lionel Clare.....  | Edmonton, Alta....  | Nov. 17, '73   | Mar. 24, '03                          | O.L.S., A.L.S., Director of Surveys, Dept. of Public Works, Alberta.            |
| Chase, Albert Victor.....        | Orillia, Ont....    | Mar. 4, '83    | Oct. 11, '10                          | O.L.S.  |
| Chilver, Charles Alonzo.....     | Walkerville, Ont..  | Feb. 8, '83    | Feb. 22, '07                          |   |
| Christie, William.....           | Prince Albert, Sask | Feb. 13, '76   | Mar. 22, '06                          | S.L.S.  |
| Clarke, Frederick Fieldhouse.... | Toronto, Ont.....   | Aug. 22, '78   | Feb. 18, '08                          | O.L.S.  |
| Clarke, Charles Wentworth.....   | Regina, Sask.....   | Nov. 19, '75   | Mar. 24, '10                          | S.L.S.  |
| Cleveland, Ernest Albert.....    | Vancouver, B.C....  | May 12, '74    | June 27, '99                          | B.C.L.S.  |
| Coates, Preston Charles.....     | Victoria, B.C.....  | May 16, '81    | April 19, '07                         | B.C.L.S.  |
| Cokely, Leroy S.....             | Duncan, B.C.....    | Nov. 23, '84   | Mar. 22, '10                          | B.C.L.S.  |
| Coltham, George William.....     | Aurora, Ont.....    | Feb. 19, '89   | Mar. 15, '13                          | O.L.S.  |
| Cond, Fritz Thomas Percy....     | Vancouver, B.C....  | May 16, '86    | May 18, '11                           | B.C.L.S.  |
| Côté, Joseph Adelard.....        | Prince Albert, Sask | June 5, '64    | May 14, '84                           | S.L.S.  |
| Côté, Jean Léon.....             | Edmonton, Alta....  | May 6, '67     | Mar. 21, '90                          | A.L.S.  |
| Côté, Joseph Martial.....        | Ottawa, Ont.....    | Aug. 25, '89   | May 13, '13                           |   |
| Cotton, Arthur Frederick.....    | Masset, B.C.....    | Aug. 8, '52    | May 11, '80                           | O.L.S., B.C.L.S.  |
| Cowper, George Constable....     | Welland, Ont.....   | Oct. 20, '86   | Mar. 11, '11                          |   |
| Craig, John Davidson.....        | Ottawa, Ont.....    | Jan. 30, '76   | Feb. 24, '02                          | Boundary Surveys, Dept. of the Interior.  |
| Cumming, Austin Lewis.....       | Edmonton, Alta....  | Aug. 25, '82   | Feb. 3, '10                           | A.L.S.  |
| Cummings, Alfred.....            | Fernie, B.C.....    | July 3, '80    | Mar. 3, '09                           | B.C.L.S.  |
| Cummings, John George.....       | Cranbrook, B.C....  | Nov. 19, '73   | Feb. 17, '04                          | B.C.L.S.  |
| Dalton, John Joseph.....         | Weston, Ont.....    | June 12, '54   | April 17, '79                         | O.L.S., D.T.S.  |
| Davies, Thomas Atwood.....       | Edmonton, Alta....  |                | Feb. 22, '06                          | A.L.S.  |
| Dawson, Frederick James.....     | Kamloops, B.C....   | Sept. 22, '86  | Sept. 12, '10                         | B.C.L.S.  |
| Day, Harry Samuel.....           | Edmonton, Alta....  | Nov. 14, '85   | Mar. 9, '10                           | A.L.S.  |
| Deans, William James.....        | Brandon, Man....    | May 4, '60     | May 13, '86                           | O.L.S., Inspector of Surveys, Dept. of the Interior.                            |
| de la Condamine, C.....          | Calgary, Alta.....  | Feb. 13, '75   | May 4, '10                            | A.L.S.  |
| Dennis, John Stoughton.....      | Calgary, Alta.....  | Oct. 22, '56   | Nov. 19, '77                          | D.T.S., Asst. to President of C.P.R.  |
| Denny, Herbert C.....            | Not known..         |                | April 1, '82                          |   |
| Dickson, Henry Godkin.....       | Whitehorse, Y.T..   | Mar. 29, '64   | Mar. 19, '89                          | M.L.S.  |
| Dickson, James.....              | Fenelon Falls, Ont. | Oct. 30, '34   | April 14, '72                         | O.L.S.  |
| Dobie, James Samuel.....         | Thessalon, Ont....  | Oct. 15, '73   | Mar. 22, '06                          | O.L.S.  |
| Donnelly, Cecil.....             | Winnipeg, Man....   | Oct. 18, '89   | Mar. 15, '13                          | M.L.S.  |
| Doupe, Jacob Lonsdale....        | Winnipeg, Man....   | Sept. 14, '67  | Oct. 6, '88                           | M.L.S., A.L.S., S.L.S., Assist. Land Commissioner for C.P.R.                    |
| Drewry, William Stewart.....     | Victoria, B.C.....  | Jan. 20, '59   | Nov. 14, '83                          | O.L.S., B.C.L.S.  |
| Driscoll, Alfred.....            | Edmonton, Alta....  | July 2, '65    | Feb. 23, '87                          | B.C.L.S., A.L.S.  |
| Drummond, Thomas.....            | Montreal, P.Q....   | 1856           | June 24, '78                          | D.T.S.  |
| Ducker, William A.....           | Winnipeg, Man....   | April 4, '52   | Mar. 30, '83                          | O.L.S., M.L.S.  |
| Duffield, Hugh Johnston.....     | Calgary, Alta.....  | Feb. 27, '72   | May 18, '14                           |   |
| Dumais, Paul T. Concorde.....    | Hull, P.Q.....      | Jan. 2, '47    | Mar. 29, '82                          | Q.L.S.  |
| Earle, Wallace Sinclair.....     | Vancouver, B.C....  | Feb. 8, '89    | May 18, '11                           | B.C.L.S., O.L.S.  |
| Edwards, George.....             | Ponoka, Alta....    | June 13, '42   | April 14, '72                         | O.L.S., A.L.S.  |



## SESSIONAL PAPER No. 25b

## APPENDIX No. 9—Continued.

LIST of Dominion Land Surveyors who are in possession of Standard Measures—  
Continued.

| Name.                              | Address.                        | Date of Birth. | Date of Appointment or of Commission. | Remarks.  |
|------------------------------------|---------------------------------|----------------|---------------------------------------|---|
| Edwards, William Milton.....       | Lethbridge, Alta.....           | June 21, '79   | April 5, '10                          | A.L.S.  |
| Ellacott, Charles Herbert.....     | Victoria, B.C.....              | Dec. 24, '66   | Feb. 22, '99                          | B.C.L.S.  |
| Ellis, Douglas Stewart.....        | Kingston, Ont.....              | Mar. 16, '85   | May 17, '12                           |   |
| Empey, John Morgan.....            | Calgary, Alta.....              | Apr. 16, '74   | Feb. 23, '05                          | O.L.S., A.L.S.  |
| Engler, Carl.....                  | Ottawa, Ont.....                | Sept. 30, '72  | Feb. 23, '05                          | T. S. Branch, Dept. of the Interior.                              |
| Evans, Stanley Livingstone.....    | Corinth, Ont.....               | Jan. 14, '84   | Feb. 13, '11                          |   |
| Ewan, Hedley Jenkins.....          | Yarmouth N.S.....               | Nov. 23, '91   | Mar. 13, '14                          |   |
| Fairchild, Charles Courtland.....  | Edmonton, Alta.....             | Feb. 21, '67   | Feb. 20, '01                          | O.L.S., A.L.S.  |
| Farncomb, Alfred Ernest.....       | Edmonton (South) Alta.....      | May 22, '73    | Mar. 12, '02                          | O.L.S., A.L.S.  |
| Fawcett, Adam.....                 | Gravenhurst, Ont.....           |                | Feb. 22, '93                          |   |
| Fawcett, Sydney Dawson.....        | Ottawa, Ont.....                | Oct. 29, '82   | May 18, '11                           |   |
| Fawcett, Thomas.....               | Ottawa, Ont.....                | Oct. 28, '48   | Nov. 18, '76                          | O.L.S., D.T.S. Boundary Surveys Dept. of the Interior.            |
| Ferguson, George Hendry.....       | Ottawa, Ont.....                | Jan. 20, '83   | June 2, '09                           |   |
| Findlay, Allan.....                | Winnipeg, Man.....              | Oct. 15, '80   | Mar. 21, '08                          | M.L.S.  |
| Fletcher, James Allan.....         | Fletcher, Ont.....              | Mar. 26, '89   | May 18, '11                           |   |
| Fontaine, Louis Elie.....          | Levis, P.Q.....                 | Oct. 3, '68    | Nov. 30, '92                          | A.L.S., Inspector of Surveys, Dept. of the Interior.              |
| Francis, John.....                 | Portage la Prairie, Man.....    | Dec. 22, '52   | June 17, '75                          | M.L.S.  |
| Galletly, James Simpson.....       | Oshawa, Ont.....                | April 15, '88  | May 18, '11                           |   |
| Garden, James Ford.....            | Vancouver, B. C.....            | Feb. 19, '47   | May 13, '80                           | B.C.L.S.  |
| Garden, George H.....              | Lethbridge, Alta.....           |                | April 14, '72                         | Deputy Surveyor for N.B.  |
| Garden, Charles.....               | Not known.....                  |                | April 14, '72                         | Deputy Surveyor for N.B.  |
| Garner, Albert Coleman.....        | Regina, Sask.....               | Sept. 6, '78   | May 27, '07                           | S.L.S., A.L.S. Chief Surveyor Surveys Branch Land Titles Offices. |
| Gauvreau, Louis Pierre.....        | Not known.....                  |                | April 14, '72                         |   |
| Gibson, James.....                 | Vancouver, B. C.....            | June 25, '60   | Feb. 12, '91                          | O.L.S.  |
| Glover, Arthur Edward.....         | Edmonton, Alta.....             | Mar. 4, '87    | Mar. 11, '11                          | A.L.S., S.L.S.  |
| Gordon, Maitland Lockhart.....     | Vancouver, B. C.....            | Sept. 27, '82  | Feb. 18, '04                          | B.C.L.S.  |
| Gordon, Robert John.....           | Lethbridge, Alta.....           | June 18, '69   | Mar. 12, '02                          | A.L.S.  |
| Gore, Thomas Sinclair.....         | Victoria, B.C.....              | 1852           | April 19, '79                         | B.C.L.S.  |
| Graham, John Robertson.....        | Vancouver, B. C.....            | April 18, '87  | May 26, '10                           | B.C.L.S.  |
| Grassie, Charles Andrew.....       | Medicine Hat, Alta.....         | Dec. 24, '83   | Dec. 27, '10                          | A.L.S.  |
| Gray, James Edward.....            | Edmonton, Alta.....             | Oct. 12, '81   | Mar. 11, '11                          | A.L.S., S.L.S.  |
| Green, Alfred Harold.....          | Nelson, B.C.....                | Jan. 20, '79   | Feb. 23, '05                          | B.C.L.S., A.L.S.  |
| Green, Thomas Daniel.....          | Rocky Mountain House, Alta..... | Dec. 21, '57   | May 19, '84                           | O.L.S.  |
| Green, Frank Compton.....          | Victoria, B.C.....              | May 4, '73     | May 8, '03                            | B.C.L.S.  |
| Griffin, Albert Dyke.....          | Elk Lake, Ont.....              | Dec. 14, '60   | May 13, '13                           | O.L.S.  |
| Grover, George Alexander.....      | Toronto, Ont.....               |                | Feb. 18, '04                          |   |
| Haggen, Rupert Williams.....       | Quesnel, B.C.....               | July 29, '87   | May 18, '11                           | B.C.L.S.  |
| Hamilton, Charles Thomas.....      | Vancouver, B. C.....            | July 29, '84   | May 18, '11                           | B.C.L.S.  |
| Hamilton, James Frederick.....     | Lethbridge, Alta.....           | April 4, '69   | June 2, '09                           | A.L.S.  |
| Harris, John Walter.....           | Winnipeg, Man.....              | Feb. 26, '45   | April 14, '72                         | O.L.S., M.L.S., Assessment Commissioner and City Surveyor.        |
| Harrison, Edward.....              | Calgary, Alta.....              |                | May 14, '10                           | A.L.S.  |
| Harvey, Charles.....               | Kelowna, B.C.....               | May 5, '76     | Feb. 17, '04                          | B.C.L.S.  |
| Hawkins, Albert Howard.....        | Listowel, Ont.....              | July 27, '62   | Mar. 6, '06                           |   |
| Heaman, John Andrew.....           | Winnipeg, Man.....              | June 3, '75    | July 15, '09                          | O.L.S.  |
| Heathcott, Robert Vernon.....      | Edmonton, Alta.....             | July 7, '81    | May 13, '07                           | A.L.S.  |
| Henderson, Walter.....             | Not known.....                  |                | Nov. 17, '83                          |   |
| Hermon, Ernest Bolton.....         | Vancouver, B.C.....             |                | June 22, '85                          |   |
| Herriot, George Henry.....         | Souris, Man.....                | Feb. 23, '83   | Sept. 18, '09                         | M.L.S.  |
| Heuperman, Frederick Justinus..... | Calgary, Alta.....              | July 23, '87   | Mar. 13, '11                          | A.L.S.  |
| Heuperman, Lambertus Fred.....     | Calgary, Alta.....              | Sept. 20, '81  | Mar. 29, '10                          | A.L.S.  |
| Hoar, Charles Millard.....         | Calgary, Alta.....              | Sept. 26, '85  | Mar. 9, '11                           | A.L.S.  |
| Hobbs, Wilfrid Ernest.....         | Winnipeg, Man.....              | Mar. 12, '87   | Mar. 5, '12                           | M.L.S.  |



APPENDIX No. 9—Continued.

List of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

| Name.                                  | Address.                           | Date of Birth. | Date of Appointment or of Commission. | Remarks.  |
|--|------------------------------------|----------------|---------------------------------------|---|
| Holcroft, Herbert Spencer. . . . .     | Toronto, Ont. . . . .              | Sept. 4, '77   | Feb. 18, '03                          | O.L.S.  |
| Hopkins, Marshall Willard . . . . .    | Edmonton, Alta . . . . .           | May 24, '61    | Feb. 20, '01                          | O.L.S., A.L.S.  |
| Hubbell, Ernest Wilson. . . . .        | Ottawa, Ont. . . . .               | Nov. 5, '62    | May 19, '84                           | Chief Inspector of Surveys, Dept. of the Interior.                  |
| Inkster, Oluf . . . . .                | Edmonton, Alta. . . . .            | Mar. 25, '85   | May 18, '11                           | A.L.S.  |
| Jackson, John Edwin . . . . .          | Hamilton, Ont. . . . .             | Dec. 27, '81   | May 18, '11                           | O.L.S.  |
| James, Silas. . . . .                  | Toronto, Ont. . . . .              | June 19, '34   | Apr. 14, '72                          | O.L.S.  |
| Jephson, Richard Jermy . . . . .       | Brandon, Man. . . . .              | Feb. 5, '54    | May 12, '80                           | O.L.S., B.C.L.S., M.L.S.  |
| Johnson, Alfred William. . . . .       | Kamloops, B.C. . . . .             | Feb. 23, '74   | Mar. 12, '02                          | B.C.L.S.  |
| Johnston, Percy Nowell . . . . .       | Edmonton, Alta. . . . .            | Oct. 4, '75    | May 10, '09                           |   |
| Johnston, James Homer. . . . .         | Edmonton, Alta. . . . .            | Aug. 23, '87   | May 17, '12                           | A.L.S.  |
| Johnston, William James. . . . .       | St. Catharines, Ont. . . . .       | Jan. 31, '81   | Mar. 11, '11                          |   |
| Keith, Homer Pasha . . . . .           | Edmonton, Alta. . . . .            | Aug. 30, '85   | Feb. 1, '11                           | A.L.S.  |
| Kimpe, Maurice. . . . .                | Edmonton, Alta. . . . .            | Jan. 17, '76   | May 13, '07                           | A.L.S.  |
| King, William Frederick . . . . .      | Dominion Observatory, Ottawa, Ont. | Feb. 19, '54   | Nov. 21, '76                          | D.T.S. Chief Astronomer, Dept. of the Interior.                     |
| Kirk, John Albert . . . . .            | Summerland, B.C. . . . .           | Jan. 9, '54    | May 11, '80                           | O.L.S., B.C.L.S.  |
| Kitto, Franklin Hugo. . . . .          | Ottawa, Ont. . . . .               | Mar. 28, '80   | Mar. 6, '08                           | Mining Lands and Yukon Br., Dept. of Interior.                      |
| Klotz, Otto Julius . . . . .           | Dominion Observatory, Ottawa, Ont. | Mar. 31, '52   | Nov. 19, '77                          | O.L.S., D.T.S., Astronomer, Dept. of Interior.                      |
| Knight, Richard H. . . . .             | Edmonton, Alta. . . . .            | June 7, '77    | Feb. 18, '04                          | A.L.S.  |
| Lamb, Frederick Carlyle. . . . .       | Saskatoon, Sask. . . . .           | Dec. 11, '88   | May 17, '12                           |   |
| Lang, John Leiper. . . . .             | Sault Ste Marie, Ont. . . . .      | Aug. 18, '84   | Oct. 14, '08                          | O.L.S.  |
| Latimer, Frank Herbert . . . . .       | Penticton, B.C. . . . .            | May 23, '60    | Nov. 13, '85                          | B.C.L.S.  |
| Laurie, Richard C. . . . .             | Battleford, Sask. . . . .          | Jan. 31, '58   | April 27, '83                         | S.L.S.  |
| Leblanc, Pierre Maxime Henri . . . . . | Ottawa, Ont. . . . .               | Oct. 1, '84    | May 13, '13                           |   |
| Lee, Roger Melville. . . . .           | Saskatoon, Sask. . . . .           | —              | '82                                   | May 11, '11   |
| Lemoine, Charles Errol. . . . .        | Ville Montcalm, P.Q. . . . .       |                | Mar. 31, '82                          | Q.L.S.  |
| Lighthall, Abram. . . . .              | Vancouver, B.C. . . . .            | Mar. 30, '78   | Dec. 25, '09                          |   |
| Lindsay, James Herbert. . . . .        | Prince Albert, Sask. . . . .       | Nov. 27, '82   | May 18, '11                           | S.L.S.  |
| Loneragan, Gerald Joseph . . . . .     | Buckingham, P.Q. . . . .           | Oct. 8, '71    | Feb. 28, '01                          | Q.L.S., A.L.S., Inspector of Surveys, Dept. of Interior.            |
| Loucks, Roy Wm. Egbert. . . . .        | Saskatoon, Sask. . . . .           | Oct. 31, '84   | Mar. 1, '12                           | A.L.S., S.L.S.  |
| Lumsden, Hugh David . . . . .          | St. Andrews, N.B. . . . .          | Sept. 7, '44   | April 14, '72                         | O.L.S.  |
| Macdonald, Colin Stone. . . . .        | Ottawa, Ont. . . . .               | May 26, '87    | Mar. 10, '14                          |   |
| Macdonald, Gordon Alexander. . . . .   | Muirkirk, Ont. . . . .             | May 24, '85    | May 17, '12                           | B.C.L.S.  |
| MacLennan, Alexander L. . . . .        | Toronto, Ont. . . . .              | May 10, '78    | Feb. 23, '05                          | S.L.S.  |
| MacLeod, George Waters. . . . .        | Edmonton, Alta. . . . .            | —              | '88                                   | Mar. 1, '12   |
| MacPherson, Charles Wilfrid. . . . .   | Dawson, Y.T. . . . .               | Sept. 6, '71   | Mar. 7, '00                           | O.L.S.  |
| Magrath, Charles Alexander. . . . .    | Ottawa, Ont. . . . .               | April 22, '60  | Nov. 16, '81                          | O.L.S., B.C.L.S., D.T.S. Member International Waterways Commission. |
| Martindale, Ernest Smith. . . . .      | Kingsmill, Ont. . . . .            | May 20, '86    | Mar. 11, '11                          |   |
| Martyn, Oscar William. . . . .         | Regina, Sask. . . . .              | Dec. 2, '88    | Mar. 11, '11                          | S.L.S.  |
| Matheson, Hugh. . . . .                | Ottawa, Ont. . . . .               | May 2, '79     | May 9, '11                            |   |
| McArthur, James Joseph . . . . .       | Ottawa, Ont. . . . .               | May 9, '56     | April 17, '79                         | Boundary Surveys, Dept. of Interior.                                |
| McCaw, Robert Daniel. . . . .          | Sidney, B.C. . . . .               | May 24, '83    | Mar. 23, '09                          | O.L.S., B.C.L.S., A.L.S.  |
| McColl, Gilbert Beebe. . . . .         | Winnipeg, Man. . . . .             | Oct. 8, '82    | Mar. 20, '07                          | M.L.S., D.T.S.  |
| McCall, Samuel Ebenezer. . . . .       | Winnipeg, Man. . . . .             | July 17, '86   | May 18, '11                           | M.L.S.  |
| McDiarmid, Stuart Stanley. . . . .     | Vancouver, B.C. . . . .            | Aug. 4, '81    | Feb. 23, '05                          | B.C.L.S.  |
| McDonald, Harold French . . . . .      | Winnipeg, Man. . . . .             | Nov. 22, '85   | Mar. 3, '13                           | M.L.S., S.L.S., A.L.S.  |
| McElhanney, Thomas Andrew. . . . .     | Vancouver, B.C. . . . .            | April 21, '86  | Mar. 17, '12                          |   |
| McElhanney, William Gordon. . . . .    | Vancouver, B.C. . . . .            | Mar. 10, '77   | Jan. 7, '11                           |   |
| McEwen, Duncan Findlay . . . . .       | Edmonton, Alta. . . . .            | Aug. 7, '76    | May 18, '11                           | A.L.S.  |
| McFadden, Moses . . . . .              | Vancouver, B.C. . . . .            | Aug. 26, '26   | April 14, '72                         | O.L.S., M.L.S.  |



SESSIONAL PAPER No. 25b

## APPENDIX No. 9—Continued.

List of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

| Name.                                  | Address.                            | Date of Birth | Date of Appointment or of Commission. | Remarks.   |
|--|-------------------------------------|---------------|---------------------------------------|--|
| McFarlane, Walter Graham...            | Peace River Crossing, Alta.....     | Sept. 28, '75 | May 19, '05                           | A.L.S.   |
| McFarlane, John Baird.....             | Toronto, Ont. ....                  | Feb. 25, '79  | June 3, '08                           | A.L.S.   |
| McFee, Angus.....                      | Red Deer, Alta.....                 | July 14, '46  | April 19, '79                         | A.L.S.   |
| McGeorge, William Graham...            | Chatham, Ont. ....                  | Mar. 22, '87  | Mar. 31, '10                          | O.L.S.   |
| McGrandle, Hugh.....                   | Wetaskiwin, Alta....                | Mar. 12, '57  | Mar. 30, '83                          | O.L.S., A.L.S.                                   |
| McKay, Robert B.....                   | Vancouver, B.C.....                 | April 21, '83 | May 21, '12                           |  |
| McKnight, James Henry ....             | Simcoe, Ont. ....                   | July 13, '85  | May 13, '13                           |  |
| McLellan, Roy Alexander.....           | Toronto, Ont. ....                  | July 31, '89  | Mar. 15, '13                          |  |
| McMaster, William Angus Alexander..... | Prince Albert, Sask.                | Feb. 1, '85   | July 6, '10                           | A.L.S., S.L.S.                                   |
| McMillan, George.....                  | Calgary, Alta.....                  | Dec. 9, '69   | Feb. 22, '06                          |  |
| McNaughton, Alexander L....            | Kelowna, B.C. ....                  | Sept. 30, '81 | Feb. 23, '05                          | O.L.S., B.C.L.S.                                 |
| McPherson, Archibald John...           | Regina, Sask. ....                  | — '70         | Feb. 21, '01                          | S.L.S.   |
| McPhillips, Robert Charles...          | Winnipeg, Man.....                  | April 24, '56 | May 17, '80                           | M.L.S.   |
| McVittie, Archibald W.....             | Victoria, B.C.....                  | May 5, '58    | Mar. 30, '82                          | B.C.L.S.   |
| Meadows, William Walter ...            | Maple Creek, Sask..                 | May 27, '73   | Feb. 23, '05                          | O.L.S., S.L.S.                                   |
| Melhuish, Paul.....                    | Vancouver, B.C. ....                | April 14, '87 | May 18, '11                           | B.C.L.S.   |
| Miles, Charles Falconer.....           | Toronto, Ont. ....                  | Jan. 30, '38  | April 14, '72                         | O.L.S., Inspector of Surveys, Dept. of Interior. |
| Mitchell, Benjamin Foster...           | Edmonton, Alta....                  | June 16, '80  | April 16, '08                         | A.L.S.   |
| Moberly, Harford Kenneth...            | Yorkton, Sask                       | — '69         | April 21, '03                         | S.L.S.   |
| Montgomery, Royal Harp....             | Prince Albert, Sask.                | May 20, '82   | Feb. 23, '05                          | O.L.S., S.L.S.                                   |
| Moore, Herbert Harrison.....           | Calgary, Alta.....                  | Dec. 1, '69   | Feb. 17, '04                          | A.L.S.   |
| Morrier, Joseph Eldedge. ...           | Prince Albert, Sask                 | Aug. 29, '74  | May 16, '07                           | S.L.S.   |
| Murray, Ernest William .....           | Regina, Sask. ....                  | Mar. 20, '84  | May 31, '10                           | S.L.S.   |
| Narraway, Athos Maxwell.....           | Ottawa, Ont. ....                   | July 19, '88  | May 18, '11                           |  |
| Neelands, Rupert A.....                | Hamiota, Man.....                   | Aug. 26, '84  | Mar. 5, '12                           |  |
| Nelles, Douglas Henry.....             | Ottawa, Ont. ....                   | Mar. 26, '81  | Mar. 9, '07                           | Geodetic Surveys, Dept. of the Interior.         |
| Nesham, Edward Williams...             | Ottawa, Ont. ....                   | June 10, '88  | Mar. 15, '13                          | Geodetic Surveys, Dept. of the Interior.         |
| Neville, Everett A. ....               | Vancouver, B. C....                 | Jan. 8, '87   | May 18, '11                           | B.C.L.S.   |
| Norrish, William Henry.....            | Ottawa, Ont. ....                   | May 10, '92   | May 13, '14                           |  |
| O'Hara, Walter Francis.....            | Ottawa, Ont. ....                   | Mar. 31, '69  | Feb. 19, '95                          | O.L.S.   |
| Ord, Lewis Redman.....                 | Hamilton, Ont.....                  | Oct. 17, '56  | April 1, '82                          | O.L.S.   |
| Palmer, Philip Ebenezer.....           | Dorchester, N.B....                 | May 6, '88    | Mar. 7, '12                           |  |
| Parsons, Johnstone Lindsay R.          | Regina, Sask.....                   | Jan. 18, '76  | Feb. 23, '05                          | O.L.S., S.L.S.                                   |
| Patrick, Allan Poyntz.....             | Calgary, Alta. ....                 | July 18, '49  | Nov. 19, '77                          | B.C.L.S., D.T.S., A.L.S.                         |
| Patten, Thaddeus James .....           | Little Current, Ont..               | Feb. 4, '59   | Mar. 29, '83                          | O.L.S.   |
| Pearce, William.....                   | Calgary, Alta.....                  | Feb. 1, '48   | May 10, '80                           | O.L.S., B.C.L.S., A.L.S.                         |
| Pearce, Seabury Kains.....             | Calgary, Alta. ....                 | Dec. 6, '87   | Mar. 9, '11                           | A.L.S.   |
| Pearson, Hugh Edward.. ....            | Edmonton, Alta ..                   | Oct. 17, '87  | May 17, '12                           | A.L.S.   |
| Pequegnat, Marcel.....                 | Berlin, Ont. ....                   | April 27, '86 | June 6, '10                           | O.L.S.   |
| Peters, Frederic Hatheway...           | Calgary, Alta.....                  | Nov. 4, '83   | Mar. 4, '10                           | A.L.S., Com. of Irrigation                       |
| Phillips, Edward Horace.....           | Saskatoon, Sask....                 | Dec. 19, '78  | Feb. 21, '02                          | S.L.S.   |
| Phillips, Harold Geoffrey.....         | Regina, Sask. ....                  | Sept. 3, '87  | April 23, '10                         | S.L.S.   |
| Pierce, Benjamin Clifford. ....        | Kingston, Ont. ....                 | Nov. 5, '90   | Mar. 13, '14                          |  |
| Pierce, John Wesley.....               | Ottawa, Ont. ....                   | July 14, '85  | Dec. 24, '09                          | O.L.S.   |
| Pinder, George Zouch.....              | Edmonton, Alta....                  | Mar. 5, '81   | Mar. 15, '13                          |  |
| Plunkett, Thomas Hartley ....          | Meaford, Ont. ....                  | June 1, '78   | Mar. 12, '08                          |  |
| Powell, William Henry. ....            | Vancouver, B.C.....                 | Dec. 22, '84  | Feb. 22, '11                          | B.C.L.S.   |
| Proudfoot, Hume Blake.....             | Prince Albert, Sask.                | June 23, '58  | Mar. 28, '82                          | O.L.S., S.L.S.                                   |
| Purser, Ralph Clinton.....             | Windsor, Ont. ....                  | April 7, '86  | Feb. 2, '11                           |  |
| Rainboth, Edward Joseph....            | Ottawa, Ont. ....                   | .....         | May 19, '81                           | O.L.S., O.L.S.                                   |
| Ransom, John Thomas .....              | Toronto, Ont. ....                  | Aug. 24, '88  | Jan. 14, '11                          | O.L.S.   |
| Reilly, William Robinson. ....         | Regina, Sask.....                   | Aug. 10, '57  | Nov. 17, '81                          | O.L.S., M.L.S., S.L.S.                           |
| Richard, Joseph Francois. ....         | Ste. Anne de la Pocatière, P.Q..... | .....         | May 13, '82                           | O.L.S.   |
| Rinfret, Claude.....                   | Montreal, P.Q. ....                 | Jan. 5, '86   | Mar. 20, '08                          | O.L.S.   |
| Rinfret, Raoul .....                   | Montreal, P.Q.....                  | July 16, '56  | Feb. 20, '00                          | O.L.S.   |



APPENDIX No. 9—Continued.

List of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

| Name.                           | Address.              | Date of Birth. | Date of Appointment or of Commission. | Remarks.   |
|---------------------------------|-----------------------|----------------|---------------------------------------|--|
| Ritchie, Joseph Frederick. .... | Prince Rupert, B.C..  | May 23, '63    | Jan. 7, '89                           | B.C.L.S.   |
| Roberts, Otto Beer.....         | Kingston, Ont. ...    | Oct. 19, '87   | May 13, '14                           |  |
| Roberts, Sydney Archibald.....  | Victoria, B.C.....    | April 10, '48  | May 16, '85                           | B.C.L.S.   |
| Roberts, Vaughan Maurice ...    | Goderich, Ont.....    | Mar. 22, '64   | May 17, '86                           |  |
| Robertson, Donald Fraser.....   | Ottawa, Ont.....      | ..... '80      | May 25, '69                           | Dept. of Indian Affairs.   |
| Robertson, Henry H.....         | N.Timiskaming, P.Q    | Sept. 13, '47  | April 14, '72                         | Q.L.S.   |
| Robertson, Edgar Doctor ...     | Edmonton, Alta....    | Sept. 12, '85  | Mar. 15, '15                          |  |
| Robinson, Ernest Walter P....   | Ottawa, Ont.....      | May 8, '80     | May 1, '08                            |  |
| Robinson, Franklin Joseph....   | Regina, Sask. ....    | Oct. 20, '70   | Feb. 20, '00                          | S.L.S., Chairman of Board of Highway Commissioners.                        |
| Robinson, William Andrew....    | Winnipeg, Man....     | Feb. 21, '81   | Oct. 2, '11                           | S.L.S., M.L.S.   |
| Rolfson, Orville.....           | Walkerville, Ont....  | Feb. 26, '85   | July 11, '08                          |  |
| Rimbough, Marshall Bedwell..    | Morden, Man.. ...     | Oct. 14, '35   | April 14, '72                         | M.L.S.   |
| Rorke, Louis Valentine. ....    | Toronto, Ont.. ....   | Feb. — '65     | Aug. 13, '91                          | O.L.S., Inspector of Surveys for Ontario.                                  |
| Ross, George.....               | Welland, Ont. ....    | June 12, '53   | Nov. 21, '82                          | O.L.S.   |
| Ross, Joseph Edmund.....        | Kamloops, B.C.....    | Jan. 9, '61    | Feb. 12, '91                          | O.L.S., B.C.L.S.   |
| Routly, Herbert Thomas. ....    | Toronto, Ont.....     | Jan. 20, '78   | Feb. 15, '11                          | O.L.S.   |
| Roy, George Peter.....          | Quebec, P.Q.....      | Oct. 1, '52    | Nov. 17, '81                          | Q.L.S.   |
| Roy, Joseph George Emile....    | Quebec, P.Q. ....     | Mar. 14, '80   | May 25, '10                           | Q.L.S.   |
| Russell, Alexander Lord.....    | Port Arthur, Ont..    | .....          | April 14, '72                         | O.L.S.   |
| Saint Cyr, Jean Baptiste .....  | Montreal, P.Q.....    | Dec. 17, '66   | Feb. 17, '87                          | Q.L.S.   |
| Saint Cyr, Arthur.....          | Ottawa, Ont.....      | Nov. — '66     | Feb. 17, '87                          |  |
| Saunders, Bryce Johnston.....   | Edmonton, Alta....    | Oct. 17, '60   | Nov. 16, '84                          | O.L.S.   |
| Scott, Walter Alexander.....    | Calgary, Alta.....    | Aug. 8, '85    | Mar. 9, '09                           | A.L.S., S.L.S.   |
| Seager, Edmund.....             | Kenora, Ont.....      | Nov. 22, '38   | April 14, '72                         | O.L.S.   |
| Segré, Beresford Henry.....     | Davidson, Sask.. ...  | Feb. 19, '86   | May 8, '12                            |  |
| Seibert, Frederick V.....       | Edmonton, Alta....    | Nov. 5, '85    | Mar. 11, '11                          | O.L.S., S.L.S.   |
| Sewell, Henry DeQuincy.....     | Toronto, Ont.....     | April 18, '48  | May 16, '85                           | O.L.S.   |
| Seymour, Horace Llewellyn....   | Ottawa, Ont.....      | June 11, '82   | Feb. 22, '06                          | O.L.S., A.L.S., S.L.S., T.S. Branch Dept. of the Interior.                 |
| Shaver, Peter Albert.....       | Calgary, Alta.....    | Sept. 24, '69  | May 18, '14                           |  |
| Shaw, Charles Eneas.....        | Greenwood, B.C....    | Nov. 16, '55   | May 10, '80                           | O.L.S., B.C.L.S.   |
| Shepley, Joseph Drummond....    | N. Battleford, Sask.  | Sept. 13, '79  | Mar. 12, '06                          | S.L.S.   |
| Smith, Charles Campbell.....    | Vancouver, B.C.....   | Jan. 1, '73    | Feb. 22, '06                          | O.L.S.   |
| Smith, Donald Alpize.....       | Regina, Sask. ....    | Sept. 22, '80  | April 21, '10                         | S.L.S.   |
| Smith, James Herbert .....      | Edmonton, Alta....    | Nov. 9, '76    | Feb. 23, '05                          | A.L.S., O.L.S.   |
| Soars, Henry Martin Robinson    | Edmonton, Alta....    | April 22, '77  | Nov. 2, '08                           | A.L.S.   |
| Speight, Thomas Bailey.....     | Toronto, Ont.....     | Feb. 8, '59    | Nov. 16, '82                          | O.L.S.   |
| Starkey, Samuel M.....          | Cody, N.E. ....       | Sept. 4, '37   | April 14, '72                         | P.L.S. for N.B.  |
| Steele, Ira John .....          | Ottawa, Ont.....      | April 6, '81   | April 16, '08                         | O.L.S., S.L.S.   |
| Stewart, Elihu .....            | Collingwood, Ont..    | Nov. 17, '44   | April 14, '72                         | O.L.S.   |
| Stewart, Lionel Douglas N. ...  | Fort Frances, Ont     | Sept. 15, '83  | Jan. 27, '10                          | O.L.S.   |
| Stewart, Will Malcolm.....      | Saskatoon, Sask       | Nov. 26, '84   | June 6, '07                           | S.L.S.   |
| Stewart, Louis Beaufort. ....   | Toronto, Ont. ....    | Jan. 27, '61   | Nov. 22, '82                          | O.L.S., D.T.S. Professor of Surveying and Geodesy, University, of Toronto. |
| Stewart, Alexander George....   | Edmonton, Alta....    | Aug. 16, '87   | Mar. 14, '10                          | A.L.S.   |
| Stewart, Alexander Stanley....  | Lacombe, Alta.....    | .....          | June 13, '08                          |  |
| Stewart, George Alexander....   | .....                 | .....          | April 14, '72                         | O.L.S.   |
| Stewart, Norman C.....          | Vancouver, B.C....    | Jan. 9, '85    | Mar. 7, '12                           | B.C.L.S.   |
| Stock, James Joseph.....        | Ottawa, Ont. ....     | Aug. 16, '87   | Mar. 2, '10                           |  |
| Street, Paul Bishop.....        | Toronto, Ont.....     | Dec. 3, '81    | Mar. 29, '10                          |  |
| Stuart, Alexander Graham....    | Buckingham, P.Q..     | July 16, '88   | May 9, '11                            |  |
| Summers, Gordon Foster.....     | Haileybury, Ont. .... | .....          | Oct. 20, '10                          | O.L.S.   |
| Swannell, Frank Cyril .....     | Victoria, B.C.....    | .....          | May 10, '04                           | B.C.L.S.   |
| Taggart, Charles Henry .....    | Kamloops, B.C....     | ..... '83      | May 9, '11                            |  |



SESSIONAL PAPER No. 25b

APPENDIX No. 9—*Concluded.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Concluded.*

| Name.                            | Address.                  | Date of Birth. | Date of Appointment or of Commission. | Remarks.                             |
|----------------------------------|---------------------------|----------------|---------------------------------------|--------------------------------------|
| Talbot, Albert Charles..         | Calgary, Alta .....       | April 5, '56   | May 13, '80                           | A.L.S., Surveyor Land Titles Office. |
| Taylor, Alexander .....          | Portage la Prairie, M.    | Aug. 6, '75    | June 9, '04                           | M.L.S., S.L.S.                       |
| Taylor, William Emerson. ....    | Toronto, Ont. ....        | Aug. 3, '81    | Dec. 16, '10                          | O.L.S.                               |
| Teasdale, Charles Montgomery     | Moosejaw, Sask. ....      | Oct. 18, '79   | Mar. 9, '06                           | S.L.S.                               |
| Thompson, William Thomas...      | Grenfell, Sask. ....      | Nov. 1, '53    | Nov. 19, '77                          | D.T.S., S.L.S.                       |
| Tipper, George Adrian. ....      | Brantford, Ont. ....      | July 25, '86   | May 18, '11                           | A.L.S.                               |
| Townsend, David Thomas. ....     | Calgary, Alta. ....       |                | Mar. 23, '07                          | O.L.S.                               |
| Tracy, Thomas Henry .....        | Vancouver, B.C. ....      | June 25, '48   | April 14, '72                         | O.L.S., B.C.L.S.                     |
| Tremblay, Alfred Joseph. ....    | Montreal, P.Q. ....       |                | Feb. 18, '90                          |                                      |
| Tremblay, Albert Jacques. ....   | Edmonton, Alta. ....      | July 25, '87   | Mar. 1, '12                           | A.L.S.                               |
| Turnbull, Thomas .....           | Winnipeg, Man. ....       | May 26, '57    | Mar. 29, '82                          | O.L.S.                               |
| Tyrrell, James William. ....     | Hamilton, Ont. ....       | May 10, '63    | Feb. 16, '87                          | O.L.S.                               |
| Underwood, Joseph Edwin. ....    | Saskatoon, Sask. ....     | Nov. 3, '82    | May 18, '11                           | S.L.S.                               |
| Van Skiver, Leighton A. ....     | Fish Lake, Ont. ....      |                | May 13, '13                           |                                      |
| Vaughan, Josephus Wyatt. ....    | Vancouver, B.C. ....      | Oct. 17, '45   | June 11, '78                          | B.C.L.S.                             |
| Vicars, John Richard Odium. .... | Kamloops, B.C. ....       | April 16, '55  | May 17, '86                           | O.L.S., B.C.L.S.                     |
| Vickers, Thomas Newell. ....     | N. Battleford, Sask. .... | April 19, '90  | May 17, '12                           | S.L.S.                               |
| Von Edeskutv, Joseph Otto. ....  | Vancouver, B.C. ....      | Oct. 27, '84   | Mar. 3, '13                           |                                      |
| Waddell, William Henry. ....     | Edmonton, Alta. ....      | Mar. 23, '83   | Mar. 25, '07                          | O.L.S., A.L.S.                       |
| Waldron, John. ....              | Moosejaw, Sask. ....      | Aug. 1, '72    | April 2, '07                          | S.L.S.                               |
| Walker, Claude Melville. ....    | Guelph, Ont. ....         | Oct. 16, '84   | Mar. 11, '11                          |                                      |
| Wallace, James Nevin. ....       | Calgary, Alta. ....       | Aug. 21, '70   | Feb. 20, '00                          | O.L.S., A.L.S.                       |
| Warren, James. ....              | Walkerton, Ont. ....      | Nov. 7, '37    | April 14, '72                         | O.L.S.                               |
| Warrington, George Albert. ....  | Winnipeg, Man. ....       |                | Mar. 15, '13                          | M.L.S.                               |
| Watt, George Herbert. ....       | Ottawa, Ont. ....         | Feb. 5, '76    | Feb. 24, '02                          | T.S. Branch Dept. of Interior.       |
| Waugh, Bruce Wallace. ....       | Ottawa, Ont. ....         | Mar. 24, '88   | May 28, '12                           |                                      |
| Weekes, Abel Seneca. ....        | Edmonton, Alta. ....      | Feb. 17, '66   | Feb. 11, '92                          | A.L.S., S.L.S., O.L.S.               |
| Weekes, Melville Bell. ....      | Regina, Sask. ....        | Nov. 28, '74   | Feb. 18, '03                          | O.L.S., S.L.S.                       |
| Wheeler, Arthur Oliver. ....     | Sidney, B.C. ....         | May 1, '60     | Nov. 21, '82                          | O.L.S., B.C.L.S.                     |
|                                  |                           |                |                                       | M.L.S., A.L.S.                       |
| White-Fraser, George W.R.M.      | Victoria, B.C. ....       |                | Feb. 21, '88                          | D.T.S., B.C.L.S.                     |
| Wiggins, Thomas Henry. ....      | Saskatoon, Sask. ....     | Aug. 24, '63   | Feb. 18, '96                          | O.L.S., S.L.S.                       |
| Wilkins, Frederick W. B. ....    | Norwood, Ont. ....        | June 27, '54   | May 18, '81                           | O.L.S., D.T.S.                       |
| Wilkinson, William Downing       | Hamilton, Bermuda. ....   | Mar. 22, '64   | Feb. 22, '93                          |                                      |
| Williams, Guy Lorne. ....        | Enderby, B.C. ....        | Mar. 3, '79    | June 24, '08                          | B.C.L.S.                             |
| Wilson, Reginald Palliser. ....  | Winnipeg, Man. ....       | July 9, '72    | Jan. 26, '11                          | M.L.S.                               |
| Woods, Joseph Edward. ....       | Pincher Creek, Alta. .... | Oct. 13, '61   | Nov. 14, '85                          | A.L.S.                               |
| Wrong, Frederick Hay. ....       | Windsor, Ont. ....        | Aug. 22, '86   | May 18, '11                           |                                      |
| Young, Stewart. ....             | Regina, Sask. ....        | Sept. 2, '84   | May 17, '13                           | S.L.S.                               |
| Young, Walter Beatty. ....       | Winnipeg, Man. ....       | July 6, '80    | Mar. 25, '05                          | M.L.S.                               |
| Young, William Howard. ....      | Calgary, Alta. ....       | June 8, '78    | May 17, '07                           | A.L.S. District Engineer.            |







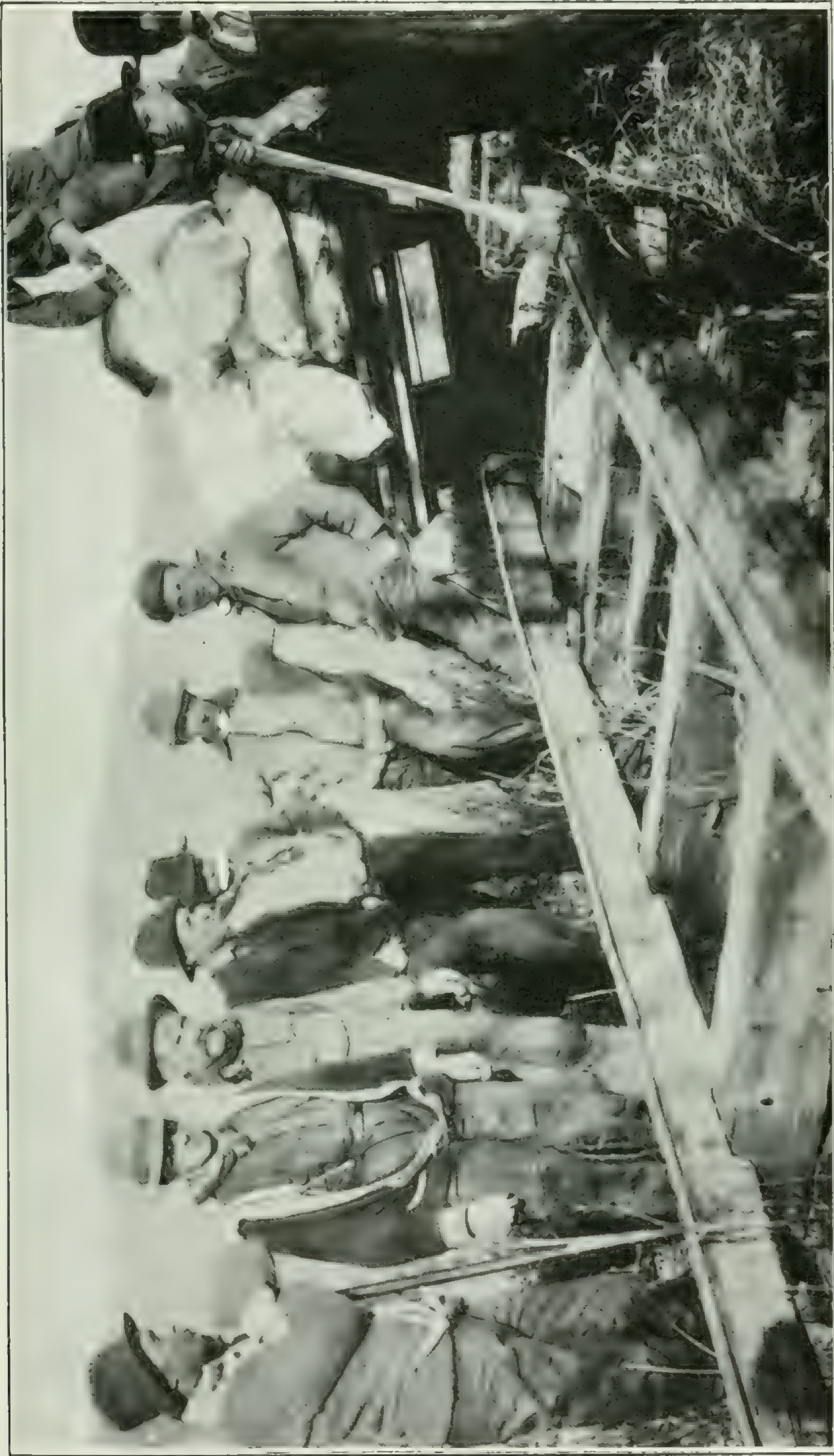


Photo by F. V. SEIBERT, D.L.S.

WRECK ON GRAND ISLAND TRAMWAY ATHABASKA RIVER.

The mode of transportation on the Athabaska river is illustrated by this and the following views. Scoops are built at Athabaska during the winter, loaded after the ice breaks up and floated down the river. Some of the rapids can be run without unloading, but at Grand Rapids it is necessary to unload. A tramway, 2,000 feet long, consisting of spruce stringers with a light iron band on top, was built on Grand Island in 1894 by the Hudson's Bay Company who charge \$2.50 per ton of freight for the use of the two push cars. Accidents as shown are frequent although the company place a man on the island to keep the track in repair and collect dues.







# REPORTS OF SURVEYORS







SESSIONAL PAPER No. 25b

## GENERAL REPORTS OF SURVEYORS

1914-1915

## APPENDIX No. 10.

## ABSTRACT OF THE REPORT OF J. R. AKINS, D.L.S.

## SURVEY OF THE 29TH BASE LINE BETWEEN THE FIFTH AND SIXTH MERIDIANS.

The survey of the base line was begun at its intersection with the Fifth meridian, about sixty miles northeast of Red River settlement, and was continued westward striking the Sixth meridian about eighty miles northwest of Fort Vermilion.

I left Edmonton with my party on April 8, 1914, and travelled by the Edmonton, Dunvegan and British Columbia railway to the east end of Lesser Slave lake, where we arrived on the 10th. There by previous arrangement we were met by teams belonging to Revillon Bros., and the outfit was taken over the ice on Lesser Slave lake to Grouard.

From there on to Peace River Crossing the trail was reported to be so bad that we had difficulty in securing teams for transportation. However a sufficient number were finally secured, and, although we found the trail in worse condition than was anticipated, we were able to reach the Crossing on April 20.

At this place we found the river open, but as drift ice was still running we were delayed a few days.

Scows, carrying about twelve tons each, which had been ordered the previous fall, were loaded on April 24, and the trip down the river was begun the following day. At Fort Vermilion, which was reached on the 30th, we were still further delayed by the drift ice, the river at this point having broken up only the day before.

The trip down Peace river was continued on May 2, and Vermilion rapids, fifty miles below Fort Vermilion, were reached the following day. These rapids extend over a distance of about thirty chains. Below this the water is smooth as far as Vermilion "chutes," a distance of three or four miles, where a drop of ten or twelve feet occurs. A party was employed during the summer of 1914 in surveying a route for a tramway around these "chutes." If this tramway and the railway to Peace River Crossing were completed all the freight for the Mackenzie basin would go down Peace river.

We experienced a great deal of difficulty at the 'chutes,' as the channel close to the south shore, where scows are usually let down with ropes, was jammed full of ice, reaching in places a height of thirty feet; we finally succeeded in forcing a passage near the north bank of the river. The scows were unloaded and run down empty, the loads being portaged both at the rapids and at the "chutes."

We reached Red River settlement on May 8, and the point where Peace river crosses the Fifth meridian on the following day. From this place a trail was cut a distance of fifteen miles to our starting point on the 29th base line. Work on the line was begun on May 16.

In range 4 Deer river was crossed. South and east of this river as far as the Peace the soil is good, the surface being gently rolling and wooded with poplar and spruce. West of the river the country rises quickly towards Caribou mountains, the summit being reached in range 5. The slope is heavily wooded with spruce and jack-pine up to twelve inches in diameter, and the top lightly wooded with stunted spruce and covered with moss. The frost remains in the ground throughout the year, the



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surface moss thawing only to a depth of about six inches. The roots of the trees do not grow deep into the ground, and are very easily pulled out during the warm weather.

Caribou mountains are of little value except as a game preserve, but if the surface moss were burned off they might produce good grazing, as bunch grass was found where a fire ran two years ago. A number of lakes are found on the plateau-like top of the mountains, but no grass grows around them as the moss extends right to the water's edge.

The part of the mountain crossed by the base line appears to be of moraine formation, as no exposures of rock were seen. The banks of the river and streams are composed of clay and gravel, and the beds are full of boulders of an igneous character. These boulders probably had their origin in the igneous rocks east of Great Slave lake, and were transported to their present location by the great glacier which came from the northeast and whose action is plainly seen in the striated rocks east of Slave river. As the Caribou mountains form quite a large physical feature, it is not likely that they were entirely formed by a moraine. Originally there may have been an elevation which interfered with the flow of the glacier and caused the deposits. The rocks under the clay and boulders are probably Devonian limestone.

After running along the top of the mountains for about forty miles, the base line begins to descend about the middle of range 11, where it crosses Carl creek. As this district has been overrun by fire, wild rye grass grows in abundance, and furnished the first horse feed found after leaving range 5.

The mountains run northwesterly from Carl creek, and the district to the south and west is nearly level or gently rolling. This district was formerly well wooded, but was overrun with fire as far as the middle of range 17; it is now covered with grass and the soil is good.

Boyer river in range 13, is about one hundred and sixty feet wide, two to four feet deep and flows five miles an hour. It has very deep cut banks; the valley is about sixty chains wide.

From range 17 to range 21 the line runs through light timber which is of small value, except for settlers' use. The trail from Hay River trading post to Fort Vermilion crosses the line in range 21. South of the base line to Fort Vermilion the trail is good, but towards Hay river it is very stony.

The district crossed by the line from Hay River trail to the Sixth meridian is lightly wooded with poplar, willow and spruce, with plenty of horse feed.

The Sixth meridian was reached on September 17, and the following day the party left for Fort Vermilion, where we arrived in time to catch the last boat to Peace River Crossing.

In the Caribou mountains bears and caribou abound. A few moose were seen on the lower country, but they are not plentiful. Feathered game is scarce owing to the presence of so many of the fur-bearing animals that prey upon them, such as foxes, mink, marten, fisher, otter and ermine. Beavers are not plentiful though some were seen.

The lakes on the mountains abound with fish, but the fishing industry is neglected, as hunting and trapping is more lucrative. For the same reason the cultivation of the valuable land around Fort Vermilion is neglected.

Fort Vermilion can be reached from Peace River Crossing by boat or raft, down Peace river, or by a pack-trail which runs to the west of the river, crosses Notikewin, Keg, Prairie and Boyer rivers and passes near Bear lake. The trail is not very good in places and does not follow the river, being sometimes forty miles from it. The trip from Peace River Crossing to Fort Vermilion by trail would require about ten days for a man on horseback.

A wagon road in the vicinity of the pack-trail would greatly aid the development of the country as nearly all the land in the valley of Peace and Hay rivers is well suited for farming, and can be easily cleared.



## APPENDIX No. 11.

## ABSTRACT OF THE REPORT OF C. F. AYLSWORTH, D.L.S.

## RESURVEYS IN MANITOBA.

On May 13 I arrived with my party in tp. 23-5-Pr., where we commenced work for the season; a resurvey was made of that portion of the township around Birch lake. We found this township well settled.

Our next work lay in tp. 22-3-Pr. In this township there is some good timber, and settlers come from as far south as Lake Francis, in tp. 15-3 Pr., to secure building material. Fire has destroyed a large amount of timber and much of the alluvial soil.

On July 23, having completed the work in tp. 22-3-Pr., we moved to Vannes and thence to tp. 20-4-Pr. to traverse a lake in section 4. We then left via Eriksdale for Lac du Bonnet, following a corduroy road along the City of Winnipeg Electric Power line and reaching there on August 10.

Our next work consisted of the resurvey of part of tp. 14-11-E. On the east side of Winnipeg river, which runs through the township, there is a strip of dry land about half a mile wide. East of this lies an impassable tamarack muskeg from which nearly all the merchantable timber has been removed.

Winnipeg river in this township, is about a quarter of a mile wide, with banks about forty feet high; the bed of the river is solid rock covered with boulders, rendering navigation dangerous. Whitemouth river flows into the Winnipeg just north of a waterfall, which occurs in the river south of the south boundary of the township. A natural rock dam which has to be portaged lies across Whitemouth river at its outlet. After traversing both banks of Winnipeg river we left for tp. 12-10-E., arriving there on October 8.

This is a very inferior township for agricultural purposes, as the soil is poor and stony and there are a great many muskegs. It is, nevertheless, being rapidly settled by Galicians.

On November 2, I closed operations for the season and returned to Winnipeg.



## APPENDIX No. 12.

## ABSTRACT OF THE REPORT OF M. H. BAKER, D.L.S.

## RETRACEMENT IN SOUTHERN ALBERTA.

During the first part of the season I was engaged on road surveys in Yoho and Rocky Mountain parks, and later on miscellaneous surveys in southern Saskatchewan and Alberta.

My first work was taking levels on the road from Field to Emerald lake, and on the branch of this road running to the natural bridge. I also surveyed the road from Field up the Yoho valley as far as it was constructed, and the road from Field to Ottertail.

This latter road follows the abandoned grade of the Canadian Pacific railway to within about one mile of Ottertail. From there a new road will have to be constructed.

The road from Field to Hector was surveyed from its junction with the Yoho valley road to where it strikes the old railway grade and thence along the grade far enough to tie to the Dominion Lands system.

In the survey of these roads levels were taken and a traverse made in each case, iron posts being planted at the traverse stations.

The next work was a survey of a lot in tp. 28-18-5, and a restoration survey of the cemetery at Field, B.C.

Completing this work on July 28 I left for Lake Louise to make a survey of the roads from the railway station to Chateau Lake Louise and also to Moraine lake.

The miscellaneous surveys in southern Alberta were commenced on August 20, the first work being the retracement of coal claims in tp. 19-4-5. Crops in the district east of this township were good and the settlers appeared to be prosperous. From Lineham in tp. 19-3-5 westward the country becomes rough, and ranching is followed. In tp. 19-4-5 the surface is heavily timbered. In ranges 2 and 3 oil-derricks were seen, and for miles in every direction the country is staked with oil claims. The coal claims are located in the valley of the south branch of Sheep river in very hilly and wooded country. The seams of coal found appear to be of excellent quality.

On September 1, I moved to tp. 19-7-5 to survey the north boundary of section 4 and the east boundary of section 8. In the latter section valuable coal seams were noticed, and coal companies have erected buildings in connection with mining operations.

After making a small restoration survey in tp. 16-4-5 I went to Wymark, Sask., to erect some monuments in that townsite. The town is newly built and some of the buildings are of a very good type. This season, however, has not been favourable to the surrounding country and the town has received a set-back in consequence.

I next went to tp. 1-4-4 to make a traverse of Milk river in section 6, but on reaching there I found that the river had changed its course southerly, and now flows south of the international boundary so that no traverse was required.

The district around Castor, Alberta, where my next work was located, bears the appearance of prosperity. Crops were excellent, and thousands of tons of hay were stacked throughout the district.

North of Medicine Hat, where I also made some miscellaneous resurveys, the crops were a failure owing to lack of moisture. This district seems best suited for ranching and it is to be regretted that farmers are settling there. They cannot be successful themselves, and their coming interferes with the ranching industry.

I closed the season's work and left for home on December 17.



## APPENDIX No. 13.

## ABSTRACT OF THE REPORT OF P. R. A. BELANGER, D.L.S.

## INSPECTION OF CONTRACTS IN NORTHERN ALBERTA.

After organizing at Edmonton the party left on April 8, 1914, for Atikamisis Lake settlement in tp. 8-11-5 where our first work was situated, travelling to Sawridge on the Edmonton, Dunvegan and British Columbia railway and thence by trail to our destination. The subdivision in tps. 80-11-5 and 80-12-5, the survey of the settlement and the running of tie lines to connect Indian reserves Nos. 155-A and 155-B with the 21st base line kept us busy until July 31 so that I was unable to begin inspection work until August 1.

A wagon road from Grouard leads in almost a direct line to Atikamisis Lake. The settlement consists of sixteen lots varying in size from twelve to eighty acres each. Fishing and trapping form the chief industries of the half-breed settlers at this place. The only cultivation of the land consists of a little gardening, with the exception of a small portion near the lake front. The settlement is well timbered. When cleared the land will produce all kinds of cereals and vegetables.

The first inspection work was in contract No. 12 of 1914, about fifteen miles north of Grouard. The trails from Grouard to Atikamisis Lake and from Grouard to Peace River Crossing, both cross this contract. The whole surface is timbered except a small belt of open land near the main trails where there are some good homesteads.

Our next work was in contract No. 6 of 1913, on the south shore of Lesser Slave lake. This contract is crossed by the Edmonton Dunvegan and British Columbia railway. The surface is covered with bush and although the land is suitable for farming purposes it needs considerable clearing. The townships in contract No. 4 of 1913, which was next inspected and which lies on the north side of the lake, are similar to those in contract No. 6. A road, a very rough one, along the north shore of the lake gives access to this district.

Contracts Nos. 8, 10, 11 of 1914, and contract No. 19 of 1913 were next inspected. These contracts all lie west and northwest of Winagami and Round lakes. The soil in this area is good but the land is covered with bush consisting of green and fire-killed spruce and poplar. Trails made by the surveyors run in all directions through the district. Homesteads will likely be taken up there as soon as the Edmonton, Dunvegan and British Columbia railway is in operation to Round lake at which point the road branches, one line going to Peace River Crossing and the other west towards Spirit River and Pouce Coupé settlements.

From Round lake district we returned to Grouard for supplies and then proceeded to contracts Nos. 5, 6 and 7 of 1914, north of Sturgeon lake. The surface in this district is generally rolling and is broken by several deep ravines near Little Smoky river. The land is mostly timbered except for a stretch of *brulé* in township 73 across ranges 22 and 23 where there are some good quarter-sections which do not require much clearing. West of Snipe lake there is a stretch of burnt country where hay grows luxuriantly, affording an ideal grazing district.

Our last work for the season was the inspection of contract No. 15 of 1914 in the vicinity of Wabiskaw lake. To reach this work we returned from Grouard by rail to Edmonton, thence to Athabaska and from there by trail to Wabiskaw lake. The land



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in this contract is rolling and is mostly heavily timbered with poplar and scattered spruce, but large areas of good hay land are found in most of the townships. The district is well adapted for mixed farming but the difficulty of access is the great drawback. At present it is reached by a pack-trail from Athabaska, a distance of about 125 miles. It can also be reached by a summer pack-trail from Sawridge and this trail could be converted into a good wagon road with small expense. Such a road would furnish good communication with the railway, promote the fishing industry of the Wabiskaw lakes and attract homesteaders to a fertile area.

Having completed this inspection I closed operations on January 16, 1915, and left for Edmonton.



SESSIONAL PAPER No. 25b

## APPENDIX No. 14.

## ABSTRACT OF THE REPORT OF G. A. BENNETT, D.L.S.

## STADIA SURVEYS IN WESTERN SASKATCHEWAN.

During most of the season my work consisted of the investigation of water areas in western Saskatchewan. Bodies of water recorded by previous surveys were examined and a stadia survey made of their present boundaries. A careful exploration of the country was also made for lakes not recorded on previous surveys. In the hills, this necessitated the examination of almost every quarter-section.

My first work was in the vicinity of tp. 35-15-3; many alkaline lakes were found in this district. The country is rolling to hilly prairie with patches of willow brush. Almost all the land has been homesteaded and the settlers appear fairly prosperous. Some of the land is too light for grain growing, and so the greater part of the income of the farmers is derived from dairying.

We next made an investigation and the necessary surveys in townships 27 to 30, ranges 24 to 29 inclusive, west of the Third meridian. Also tp. 29-1-4 and tp. 28-3-4 were fully investigated and surveyed.

These townships are composed of rolling to hilly prairie. The land has practically all been taken up, and about twenty-five per cent is under cultivation. The homesteaders are gradually working into mixed farming and now supply the local demand for eggs and dairy products. The hot winds and drought very nearly destroyed the grain crops this year throughout this district.

A number of townships in the vicinity of Tramping lake, were next explored and surveyed. There almost all the marshes, sloughs and lakes, which existed at the time of the original survey, were found to have dried up. White Heron lake in tp. 34-22-3 may be specially mentioned as an example of the changing topography. This lake which covered an area of 820 acres when first surveyed was found to be absolutely dry. The settlers had a fine road graded across the centre of the old lake bed, and homesteaders were applying to be allowed to go upon the dry bottom to try farming it.

A gradual improvement in the crops was noted as we carried our investigation north. Around Tramping lake good yields of wheat and fair crops of oats were harvested.

I closed my stadia surveys on October 15, stored the outfit and accompanied only by my assistant, I proceeded to Alberta to make some small miscellaneous surveys. Our first work of this kind was in a group of ten townships around Sullivan and Dowling lakes, southeast of Stettler.

This district has been homesteaded during the last few years and the settlers are successfully engaged in mixed farming, and already they have fine houses and commodious barns. Vast quantities of hay are cut every year by the homesteaders in the marshes around the numerous lakes and sold to the large ranchers to winter their thousands of cattle for which there is not now sufficient winter pasture. Ducks and geese were noticed in great numbers on the lakes, and prairie-chickens were fairly plentiful.

On November 12, I proceeded to Innisfail to investigate the survey of the 9th correction line across ranges 28 and 29 west of the Fourth meridian. On making a retracement survey I found that errors in the survey of the south side of the correction line had closed the road entirely in some places. The settlers of the vicinity



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were most pleased to find that steps were being taken towards opening up this road, which they desire to grade and make their principal road to town. This district has been settled many years and the farmers are now well-to-do.

Retracement surveys were next made in tp. 37-25-4. This township is very hilly and covered in parts with heavy scrub willow, yet it has been homesteaded and the settlers are engaged in dairying.

I then surveyed a small lake in tp. 55-24-4, which had dried up considerably since the previous survey.

The retracement required to correct the records with reference to the position of a witness monument in tp. 42-28-4 completed the surveys for which I had received instructions. I therefore closed operations and reached home on December 3.



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## APPENDIX No. 15.

## ABSTRACT OF THE REPORT OF G. H. BLANCHET, D.L.S.

SURVEY OF PARTS OF THE 24TH AND 25TH BASE LINES, WEST OF THE FOURTH MERIDIAN,  
NORTHERN ALBERTA.

On May 1, 1914, I left Athabaska with my party and outfit, loaded on three scows, and proceeded down the river to McMurray, arriving there on the 11th. At this point the horses, which had been sent overland via Lac la Biche, were loaded on the scows. The following day we reached McKay, where we cached supplies to be used on the survey of the 24th base line. We then floated down to Tar river and landed the remainder of the outfit.

A pack-trail was opened up along Tar river to its intersection with the 25th base line (north of township 96) at the westerly side of range 12, which was the starting point of our survey. We reached there on May 18 and the following day after retracing a portion of range 12, the production of the line westerly was begun.

From Athabaska river, which crosses the line in range 10, westerly towards Birch mountains, the country rises steadily, the ascent becoming marked in range 13, at the westerly side of which the summit of the southeasterly spur is reached. The easterly ascent has for the most part escaped fires and is covered with a fairly heavy growth of poplar, spruce and jackpine, and is well drained.

Birch mountains is the name applied to an extensive elevated area occupying most of the country lying between Athabaska and Wabiskaw rivers and having for its approximate south boundary a line joining the mouth of Calumet river and Chipewyan lake. The boundaries of this area are very irregular and its surface varies greatly in roughness and in the direction of its ridges. A marked feature of this area is the accumulation of boulders at the surface, indicating its probable origin as glacial. The rolling nature of its surface gives it in general a fair drainage. In range 14 Joslyn creek is crossed, flowing through a wide deep valley. It emerges from the hills a short distance to the south and flows through an undulating country enriched by the alluvium from the hills, and which in general is fairly well timbered with poplar and small areas of spruce. North of the line along Joslyn creek the country is rough, hilly and for the most part burnt over.

In range 15 the country draining into Namur river is entered, the streams flowing southwesterly. Namur river crosses the line near the middle of range 16, and is the largest stream in that part of the country. It has its principal source in the lake of the same name which is crossed by the line at the end of the next range. Another fairly large branch of it rises to the northeast near the Athabaska. It continues south and a little westerly to the correction line and then swings in a northeasterly direction to Athabaska river. The country along this river where it runs through the hills has not much agricultural value, but along its lower course there are considerable tracts of good poplar lands. This river with its tributary streams forms the main drainage of the country extending from the 26th base south to the correction line between the 24th and 25th base lines, and from Athabaska river westward to range 19. Namur lake, the southerly end of which is crossed by the base line in the westerly side of range 17, is about seven miles long and from one to two miles wide and is surrounded by high lands. It contains several islands and has a gravel bottom. Fish abound in this lake. There is a possible canoe route from it to the Athabaska.



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After leaving Namur lake a well-pronounced divide having a northeasterly and southwesterly course was crossed. This ridge, on which the maximum elevation in this part of the country is reached, forms in general the "height of land," although there are several cases where drainage passes around it. The line descends abruptly in the westerly part of range 18 to Legend lake, so called from the superstitious dread the Indians have of it on account of monsters supposed to inhabit it. This lake is about nine miles long and varies in width from one and a half to three miles, the base line crossing at its southerly end. It forms one of the principal sources of Birch river. Here also fish are abundant, and in the surrounding hills are many moose and caribou.

Westward from Legend lake the line enters a moderately rolling country of fairly high altitude, which is dotted with small lakes draining through small sluggish creeks to the north, and there uniting to form Mikkwa river. From range 20 Mikkwa river occupies a well-defined valley near the 25th correction line, the hills north of it forming the divide between it and Birch river. The base line follows the high land to the south which divides its drainage from that of Liége river. Thus it can be seen that in the neighbourhood of the 25th base line in ranges 18 to 20 five large streams have their sources, namely: Namur, Birch, Mikkwa, Liége and Dunkirk rivers. Birch mountain plateau, except along its borders or large valleys, contains large areas of muskeg, and the soil on the ridges is light and contains many boulders. Little merchantable timber remains.

While extending the line across range 21 a fire got into our cache, destroying most of our supplies and making it necessary to move back about eighty miles to our supply depot at McKay, which we reached on July 13. It was decided to leave the remainder of the 25th base line till after the 24th was completed and then return to it from the west. While at McKay some of the men left, and it was over a month before the party was made up to full strength again.

We travelled from McKay by an old Indian trail, to its intersection with the 24th base (north of township 92) at the east side of range 11, and moved along the line to the end of this range where our work began. Heavy rains during the next few weeks hindered the work considerably. An attempt was made to move a cache up McKay river which crosses the line at the east side of range 12, but it was found too crooked and after the first few miles too much broken by rapids.

McKay river drains the country south of the Namur and north of Thickwood hills, and has a drainage area of roughly sixty miles by thirty. The river enters the Athabaska about eight miles north of the line in range 11. It flows in a deep narrow valley with limestone outcrops in many places. Above these outcrops are extensive beds of tar sands whose richness is shown by tar springs at several points. About eight miles up-stream Dover river comes in from the north. After crossing the line in range 12 McKay river swings westerly to range 16 where it is about eight miles south of the line. Here it forks, the main river turning south while a large branch called Dunkirk river comes in from the northwest. This crosses the line in range 18 and again forks, both branches rising in the Birch hills to the north. The country adjacent to McKay river and its branches, except in their headwaters, is for the most part well timbered with poplar, spruce and jackpine. Small water-powers could be developed easily and cheaply at many points. Much of the country lying between the different branches is of fair agricultural quality.

From range 17 to range 20 the line ran through a very level stretch of country in which the drainage is sluggish and consequently, the country is practically all muskeg extending north to the Birch hills and to the south forming part of the great interior muskeg.

At the westerly side of range 20 the line ascends the southwesterly extension of Birch hills and continues on this elevated area to the meridian. The surface varies from rolling to rough and much of it has been fairly cleanly burnt over, but to the north



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the country is more timbered. Numerous fairly large creeks rise in the hills to the north and flow southwesterly into Wabiskaw river. There as elsewhere, on the Birch hills the surface is thickly strewn with boulders, and the soil is inclined to be light. The principal stream flowing through this portion of the country is that called Liège river which drains the country south of the Mikkwa and west of McKay river.

The Fifth meridian was reached on October 7.

We still had twenty-one miles of the 25th base line to complete so proceeded by way of the Burnt lake trail to its intersection with the Fifth meridian and thence along the meridian trail to the northeast corner of tp. 96-1-5, whence we opened up a trail easterly to near where work had been abandoned. Most of this travel was over bad muskeg and as the horses were loaded heavily and feed poor and scarce, the trip tried them severely, playing out the older and poorer ones completely.

The work of completing the line proceeded rapidly. The country passed through by the line was that adjacent to the divide between Mikkwa and Liège rivers; although of high altitude and rolling, it was principally muskeg in which the feeders of both streams have their rise. This portion of the country at one time supported a heavy growth of timber in places, but this has been almost completely burned off and is replaced by a thick second-growth of spruce and jackpine.

The line was completed to the Fifth meridian on October 29 and on the following day we started for Edmonton, travelling by Wabiskaw river trail to Wabiskaw and thence by the mail route to Sawridge. The contractors of the Edmonton, Dunvegan and British Columbia railway were operating a passenger service to Edmonton and we were able therefore to travel the remainder of the distance by train.

We reached Edmonton on November 21 and the party was disbanded the same day.



## APPENDIX No. 16.

## ABSTRACT OF THE REPORT OF E. P. BOWMAN, D.L.S.

## STADIA SURVEYS IN SASKATCHEWAN.

The work on which I was engaged during the season of 1914 consisted of an investigation of all water areas in certain townships which had been subdivided a number of years ago, and the survey by stadia of all water areas over five acres in extent which appeared to be permanent.

It has been found that in some cases these water areas have changed considerably since the time of the original survey, especially in prairie country, where many of the lakes previously traversed have either dried up entirely or dry up during the summer, thus rendering new areas suitable for agricultural purposes. In bush country, however, the reverse is often found to be the case, new lakes, missed in the original survey, being found. These cause complaints from the settlers, when they find that parts of their homesteads are useless for farming because of previously unsurveyed bodies of water.

In addition to the investigation of water areas, considerable retracement work was done, monuments being erected at section and quarter-section corners where bodies of water, which prevented the erection of monuments at the time of the original survey, have dried up.

My first work was to complete the investigation of water areas in townships 37 to 40, inclusive, ranges 14 to 17, inclusive, west of the Third meridian. I also included tp. 40-18-3 in my work in this district.

The general nature of this block of townships is fairly uniform with the exception of tps. 39 and 40-14-3, and the north part of tp. 40-15-3, which are mostly bush country and have some deep permanent bodies of water. Throughout the greater part of the district the lakes seem to be gradually drying up, although there are a few exceptions. Most of them are quite shallow, containing chiefly alkaline water, some with very soft, and others with fairly solid beds. Nearly all small marshes shown formerly on the township plans at section and quarter-section corners had dried up, allowing the erection of monuments. The surface varies from undulating to rolling and occasionally hilly prairie. Practically all available good land has been taken up. In some townships lands are nearly all patented, while in other townships they are in the earlier stages of homesteading. Settlement is well advanced in some parts and in other parts very little settlement has taken place. Patented lands do not always indicate well settled country, as these lands are often held by the railway companies or by private individuals, who have secured their patents and left their lands, and thus quite frequently a district in which homestead duties are being carried on presents a better settled appearance than those where lands are all patented. Grain growing is the main industry pursued by the farmers and gives good success, although mixed farming is followed in parts more remote from the railways and where hilly or stony land is found. The latter method seems to be gaining in favour among the settlers. Graded roads are being constructed in most of the townships along the road allowances, and where these are not built good trails are generally found. Water is obtained by digging or drilling to a depth of from fifty to one hundred and twenty-five feet. Fuel is obtained by teaming from the forest reserve in tp. 40-14-3, although coal is used by some. The Battleford-Biggar branch of the Grand Trunk Pacific railway has been a great help in the development of this district.



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In addition to the investigation and traverses of lakes in this block of townships, seventy-three section and quarter-section corners were established, necessitating the retracement of about eighty-six miles of section lines.

Crops in this district were rather light in some parts, due to dry weather in the early part of the summer.

The work in this district was completed on September 8. I then moved north to investigate townships 52 in ranges 22, 23 and 24. During this move, we passed through the Cutknife district, where the crops were exceptionally good, not having had as much dry weather as other districts farther south where crops were very poor. We also passed through Paynton, crossing the ferry on Saskatchewan river north of Paynton, and continued north till we reached the old Fort Pitt-Battleford trail, which we followed northwesterly to tp. 52-24-3. Considerable very sandy land lies along this old trail, soft drifting sands occurring in many places, thus making transportation of heavy loads very difficult. Very little settlement was found along this part of the trail, the soil probably being too light for farming.

Work was begun in these townships on September 15. They are mostly well settled, most of the settlers being engaged in mixed farming and stock raising, for which the townships are well suited.

I closed operations on October 15 and returned to Battleford on the 16th.

In connection with the condition of water areas this year, the early part of the season was dry and hot, and the water was said to be lower in the prairie district than it usually is. In the country north of Saskatchewan river, particularly the last two townships surveyed, the water was higher than usual, due to heavy rains in August and September. Many of the hay sloughs cut for hay during the summer had a few inches of water in them at time of survey. Englishman river was also said to be much higher than it had been earlier in the season.

In the last three townships surveyed, six section and quarter-section corners were established and six miles of section line were retraced.

The absence of railways in the proximity of these townships is rather a drawback, but the construction of the Edam branch of the Canadian Northern railway through to Turtleford, to which place trains now run, improves conditions.

On our return to Battleford we travelled by way of the old Fort Pitt-Battleford trail, although the road allowances have to be followed the greater part of the way. Very fine farming country lies along the line of the Canadian Northern railway at Edam and other points along the line to Battleford.



## APPENDIX No. 17.

## ABSTRACT OF THE REPORT OF W. J. BOULTON, D.L.S.

## STADIA SURVEYS IN SOUTHERN ALBERTA.

The work on which I was engaged during the past season consisted of the survey of lakes in southern Alberta, my first work being the survey of a lake which crosses the base line between tps. 8 and 9-18-4. This lake is evidently much larger in area than when originally surveyed, due to the fact that it is being used as a reservoir by the Irrigation department of the Canadian Pacific Railway company. The fluctuation in depth is very moderate, and does not materially affect the area of the lake surface. The water is clear and drinkable, but is cumbered with weeds near the shore. The confines of the lake are hills, ranging in height from seventy-five to one hundred and twenty-five feet, the crest averaging a distance of two hundred feet from the water-line.

I then surveyed the portion of a lake lying in township 8, range 18, and those parts of Reservoir, and Chin Coulee lakes in township 9. The area extending for two or three miles on either side of Chin coulée is not settled upon.

On June 29 I moved to range 15, and proceeded with the investigation of townships 9 and 10, which I found to be fairly well settled. An artesian well was found on section 9, in township 10. Townships 7 and 8 are sparsely settled and are chiefly used for sheep grazing.

On July 4, I moved into range 16, and commenced operations in township 7. A large lake extends from section 26 in range 16 to section 36 in range 17. This lake is now an abandoned irrigation reservoir, the course of the water having been diverted in another direction. The lake at present has no inlet or outlet, but is fed to a certain extent by springs. The water is gradually receding, but the rate of recession is so small that the lake may be considered as permanent in character. The shore-line is quite definite and stony, and the immediate confines quite steep.

This lake, as is the case of the other lakes in Chin coulée, provides a means for the farmers in the district to water their stock, and in fact, renders it possible for them to engage in the stock-raising industry.

There is no doubt that the district to the east, up the coulée, in township 7, range 15, could be rendered useful for stock raising by raising the elevation of the lake just mentioned, about six feet, and constructing a small ditch between that lake and the low-lying land immediately to the east. This would create another large lake in the coulée, and enable the few farmers, already in the district, to have a much shorter water haul, and would ultimately induce others to come into the district and raise stock.

I next investigated tps. 7, 8 and 9-17-4 and tps. 8 and 9-16-4. I first finished the survey of the lake which I had started, while investigating tp. 8-18-4, and which I found to extend into range 17, running southeasterly from section 19 to section 2, thence into section 35, tp. 7-17-4. At the eastern end of this lake is found the immediate source of water supply in the form of an irrigation canal conveying the water from St. Mary's river. These townships are fairly well settled, and a goodly portion is under cultivation.

On July 28, I proceeded to township 9, range 19, from which I thoroughly investigated townships 8 and 9 and parts of townships 7 and 10.





Photo by F. V. SEIBERT, D.L.S.

#### SHOOTING GRAND RAPIDS—ATHABASKA RIVER.

After unloading at the head of Grand Island, the scow is taken back to the right-hand channel, and run through to the eddy below the foot of the island. At low water this is a very difficult undertaking for the channel is, in many places, just wide enough for a scow to pass, and the current is so swift that it leaves a very small margin of control of the scow by the crew. Only a few of the best river men will undertake this, and then only with the very best crew.



Photo by F. V. SEIBERT, D.L.S.

#### STUCK ON A ROCK IN GRAND RAPIDS—ATHABASKA RIVER.

At low water, this rock is in the middle of the channel and impossible to avoid. Fortunately it is round and smooth and seldom does damage to the scow. Sometimes the scow slips over without stopping, but when it stops, it must be kept heading down stream. In the view, a pole against the port bow keeps it from swinging. Should the scow swing, the chance of saving it from being broken to pieces is small.







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In township 9 I found the areas of four lakes to be considerably augmented, as they are being used as irrigation reservoirs. Generally speaking, these lakes are very shallow, with a more or less indefinite shore-line, and are much overgrown with weeds. The areas are subject to slight variations, depending entirely upon the amount of water used or wasted in irrigating the district.

The southerly part of township 9 and the northerly part of township 8, have been thoroughly irrigated, and some excellent crops of alfalfa, clover and potatoes were grown during the season. Excellent grazing is found in these townships, and many farmers, engaged in mixed farming, are making substantial profits.

On August 19, having ascertained that Belly river was normal, I decided to prosecute my investigations in the townships traversed by this stream. Consequently I moved north and commenced operations in sec. 36, tp. 10-19-4 and gradually worked east across tp. 10-18-4 and tp. 10-17-4, thence north through tps. 10, 11 and 12-16-4, finishing up on the E. By, sec. 13, tp. 11-16-4, which was the easterly limit of my district. About the time I completed this work, the district was visited by an extremely heavy and wet snowstorm, which continued intermittently for about ten days. In the meantime, I moved through almost impassable roads to tp. 10-19-4 and succeeded in completing the survey of Belly river in this township and in township 11, range 18, on October 14.

The course of Belly river is very winding and many nice flats are available on the convex sides of the bends, while the concave sides are generally cut banks about seventy-five feet high.

The river is not so wide as it was at the time of the original survey, due no doubt to the immense amount of water now being diverted through irrigation canals leading from St. Mary's river. Consequently there is considerable forest growth to be found on what were once termed "sand-bars."

The maximum flow usually occurs in June or July, and the minimum in January or February, the difference in the height of the water, being ordinarily, about five or six feet.

There is plenty of good household coal to be found along the valley of Belly river, the seams being plainly evident in the cut banks. They vary from two to five feet in width.

Work on Belly river was impeded at times by the presence of rattlesnakes. Fortunately none of the party were bitten, although we managed to kill twenty-five of the reptiles.

On October 14, I moved to Coaldale, a small town on the Crowsnest branch of the Canadian Pacific railway, and intended to complete the investigations which I had begun in tps. 8 and 9-20-4, and tp. 7-19-4, but the country, especially in the central part of tp. 9-20-4, was completely inundated by the over-supply of irrigation water, which seems to be very poorly controlled.

Some parts of the townships in the district showed signs of there having been lakes at one time, but it is so long since, that the vegetation in these low-lying parts is on a par with that of the surrounding country.

The district is, generally speaking, more or less settled upon, and considerable land has been broken and once cultivated, but during the past few years, the precipitation has been so slight that much of the land is being allowed to return to its original prairie state, and many places are being abandoned.

Scarcity of water seems to be the chief drawback to this district. When properly irrigated, however, the soil, which is generally of a light sandy nature appears to be very productive. The Irrigation department of the Canadian Pacific Railway company had, during this season, four parties of engineers making preliminary investigations in this district, with a view to ultimately constructing irrigation canals and dependent laterals. In the event of this work being done, this district will prove to be one of the most productive in the province of Alberta.



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The trails throughout the entire district are first-class and are, in general, confined to the regular road allowances.

Shipping facilities are of the best as the Crewsnest branch of the Canadian Pacific railway passes east and west through the centre of the district, and along it there are elevators erected every six or seven miles. Another branch of this railway, which will be known as the Lethbridge-Weyburn line and which follows approximately the 2nd correction line, is being constructed through the district.

The whole district seems to be underlaid with coal, and it is being mined extensively in the vicinities of Lethbridge and Taber.

Many ducks and geese were seen around the lakes in Chin coulee, especially those in tp. 9-10-4 which are veritable duck ponds. Many antelope were also seen along Belly river.

In eleven of the townships, which I investigated, I found no water areas at all.

I closed operations and paid off my party on October 17.



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## APPENDIX No. 18.

## ABSTRACT OF THE REPORT OF L. BRENOT, D.L.S.

## SUBDIVISION IN PEACE RIVER DISTRICT.

My survey work during the summers of 1913 and 1914 and the intervening winter consisted chiefly of the subdivision of lands suitable for settlement along the Peace river valley between Fort St. John and Hudson Hope.

Most of the fertile land in this district lies on the north side of Peace river, the land south of the river having been so often overrun by fire that it is almost sterile. The areas surveyed on the north side of the river are easy of access, and consist mostly of flats and bench land in the river valley. The notable exceptions are a plateau north of Fort St. John and an area in tps. 83 and 84-20-5 known locally as "Jim Rose prairie." The bench land and flats are backed by hills from 700 to 1,100 feet high, and the steep slopes of the hills are covered with luxuriant grass which appears early in spring, before the snow has disappeared from the valleys. These grassy slopes will furnish admirable ranches for stock from the farms situated on the benches and flats.

The good land in the flats is covered with small poplar which will have to be cleared and this may prevent the early settlement of the district. Settlers are located on Halfway flats in tp. 83-22-6, on Cache creek flats in tp. 84-21-6 and on South Pine flats in tp. 83-18-6. We subdivided the land at all of these points. South Pine flats, though not of great extent, encroach on four townships, and over eighty miles of outline had to be run before making the subdivision.

While in that vicinity we ran the boundaries of timber berth No. 2052, in townships 80 and 81 ranges 15 and 16. This work carried us late into the fall, and as the ice was commencing to run in the river, we abandoned subdivision work in that vicinity and left for Hudson Hope.

As soon as the river had frozen over I subdivided part of tp. 82-25-6. I then cut a trail to Moberley lake district and performed the subdivision necessary in tps. 79 and 80-24-6; the trail cutting was rendered very difficult by the dense undergrowth.

Having finished this work, I returned to Hudson Hope and resurveyed the Hudson's Bay company's reserve there. I then divided the party, sending four men and one assistant to level the west boundary of Peace River block between the 21st and 22nd base lines, and with the remainder of the party I proceeded to survey a number of township outlines and subdivide the land suitable for settlement in tp. 82-24-6.

When the levelling and subdivision were completed we built a raft and floated the outfit down Peace river to Fort St. John. While on the raft I took soundings of the river and found the average depth in mid-channel to be about ten feet, though in places it was only five feet. The current runs from three to five miles per hour and the width of the river ranges from twenty chains to one mile.

At Fort St. John we surveyed two Hudson's Bay company's reserve lots, and finished the subdivision of South Pine flats. I closed operations on September 26, and left for Edmonton, where I arrived on October 10.



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The climate of the Peace river district is similar to that of eastern Canada and is free from extremes. The summers are moderately hot and the rainfall is adequate. Summer frosts were of somewhat frequent occurrence during our survey, but were not severe enough to do much damage. During a cold snap in the last two weeks of January, 1914, the thermometer registered  $-54^{\circ}$  F., but after the Chinook winds began about the middle of February the temperature was rarely many degrees below freezing point.

The snowfall is not very heavy. Trails connect the various settlements, though the fording of rivers whose beds are composed of shifting sands, renders travel in summer dangerous. The ice on Peace river, which is safe from the middle of January to the middle of March, furnishes a good road for winter travel.

Post-offices are established at Fort St. John and Hudson Hope; mail being taken overland from Lake Saskatoon once a month. The service is rather uncertain, as it depends largely on the condition of the various rivers crossing the trail. The Edmonton, Dunvegan and British Columbia railway when built will greatly assist in the development of this district.



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## APPENDIX No. 19.

## ABSTRACT OF THE REPORT OF M. P. BRIDGLAND, D.L.S.

## TOPOGRAPHICAL AND TRIANGULATION SURVEYS IN SOUTHWESTERN ALBERTA.

My work during the season of 1914 consisted of a topographical survey of the southern part of the Crowsnest Forest reserve, and a retracement of the triangulation of the Rocky and Selkirk mountains from Calgary to within a short distance of Golden.

In order to complete these two surveys in one season it was considered advisable to start work on the latter as early as possible. Accordingly on May 12, I engaged one man and commenced this survey which was continued until May 26. During this period signals were erected at stations I to VIII inclusive, and angles read at stations I to VI inclusive. An azimuth observation was taken at station III.

As further work was then impossible, owing to the amount of snow still remaining on the higher peaks of the mountains, I returned to Calgary, engaged more men, and on May 27 proceeded to Lundbreck where the camp equipage and supplies had previously been shipped. From there we proceeded to our first camp in tp. 6-3-5 from where the survey of the Crowsnest Forest reserve was carried on until July 6.

Two extra men were then engaged, and the party was divided. My assistant with three men moved south to Beaver Mines and continued the survey of the reserve, while I with four men left for Morley on the main line of the Canadian Pacific railway, to continue the triangulation survey.

This was completed on August 31. During the intervening period thirteen stations VII to XVIII inclusive, and station "C," Beaverfoot range, were occupied, nine of which were over 9,500 feet above sea-level. Angles were read at all these stations and azimuth observations taken at Beaupre hill and Mt. King. A third azimuth observation was taken in the Bow valley near Storm mountain. All stations not previously marked were marked permanently.

On September 1, my horses and outfit were shipped by train from Field, B.C., to Hillcrest, Alberta. From there we moved south, and on September 7 joined the other party on the headwaters of Yarrow creek in tp. 3-1-5. The remainder of the season was spent by the combined parties in completing the survey of the Crowsnest Forest reserve.

The last main camp was near Waterton lakes, and supplies were brought out from Pincher Creek. At this point a very heavy snowstorm began on October 2 and lasted several days, rendering further work impossible. The party returned via Pincher Creek, reaching Calgary on October 8.

The southern part of the Crowsnest Forest reserve is about seven hundred square miles in area, and comprises the eastern slope of that part of the Rocky mountains lying between the Crowsnest branch of the Canadian Pacific railway and the international boundary. The summit of the Rocky mountains, the western boundary of the reserve, crosses the international boundary in range 1, west of the Fifth meridian, and extends in a northwesterly direction to tp. 7-6-5. The eastern boundary, which is laid out on section lines of the Dominion Lands system, and is approximately parallel to the summit, lies about fifteen miles farther east. To the north in townships 5, 6 and 7, the peaks along the summit are from 8,000 to 9,000 feet high, while east of this the hills are low and rolling, only a few of the higher points rising above timber-line. Still farther east, beyond the reserve, the hills drop off gradually toward the prairie. Farther south, in townships 1, 2, 3 and 4, the main range loses its distinctive characteristics. It



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becomes much more broken and several good passes exist, of which the Akamina pass in tp. 1-1-5, is worthy of note, being crossed by a good wagon road. The country to the east becomes much more rugged and broken, peaks from 7,500 to 8,500 feet in height extending to the easterly limit of the reserve, where the change from mountains to very low foot-hills or rolling prairie is very abrupt.

As in the previous season, no organized system of triangulation was carried out, but angles were read to connect different stations as well as possible. Stations adjacent to the railway were located by the traverse made in 1913, and these in conjunction with the Dominion Lands system posts were used to locate the stations in townships 5, 6 and 7. Farther south, a closed triangulation, made in 1912 by the Geological Survey of Canada and based on the international boundary surveys, was used as a control, though several ties were made to the Dominion Lands system. Elevations were carried from stations south of the railway, altitudes of which had been determined by the traverse of the Crownest branch of the Canadian Pacific railway during the previous season.

The season of 1914 was not very favourable for photographic surveys. The time spent in the field from the date of commencing until the closing of actual work was one hundred and twenty-five days. During this period forty-six days were totally lost owing to bad weather, and many other days were partially lost. In September, when trying to complete the work, while only thirteen days were entirely lost, there were but nine fine days during the entire month. Much difficulty was caused throughout the whole season by high winds, which made it almost impossible to keep the camera steady or to read satisfactory angles with the transit. During the season one hundred triangulation stations, exclusive of section corners or secondary camera stations, were occupied, and sixty-three dozen plates were exposed.

Nearly all of the country is easily accessible. Wagon roads lead along the eastern escarpment, and in some places run well into the reserve. Good pack-trails with easy grades, and free from swamps or muskegs, are found in all the main valleys. Pasture for horses is very plentiful along the eastern slopes, and occasional meadows are found farther in toward the mountains. Flowers and vetches were not seen in nearly as great variety or abundance as in the previous season, while north of the railway, wild black currants were the only edible berries found in any quantity.

The western part of the reserve is heavily forested right up to the escarpment of the main range, and in the southern part where the country is more broken nearly all the main valleys are well timbered. Although the slopes adjacent to the railway have been burned, the greater part has not been touched by fire and contains much excellent spruce, with some fir. Jackpine up to one foot in diameter is found in places. In the eastern part the slopes and valleys are more open with much small poplar and willow, and scattered clumps of fir and jackpine.

Large deposits of coal occur in townships 5, 6 and 7, and mines have been started in several places, but only those near the railway are being worked at the present time. Oil wells have been drilled in three places, but no oil has been found and the wells are now abandoned. Farther south in tp. 1-30-4, there is another well which was started some years ago and abandoned. It is now being worked under new management, and at a depth of 970 feet is yielding fifteen to eighteen barrels of crude oil per day. It is intended to drill deeper as soon as the winter is over.

Fish and game are said to be very plentiful. Fish, however, did not seem nearly so numerous as in that part of the reserve north of the railway, although the Waterton lakes district is considered a good fishing place, and is a popular summer resort. There are some bears, and deer and goats were occasionally seen. On Sheep Mountain, near Waterton lake, several mountain sheep were seen and the whole mountain was covered with fresh tracks. Prairie-chickens were common in the open hills near the prairie, but game birds of other varieties did not seem numerous.



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## APPENDIX No. 20.

## ABSTRACT OF THE REPORT OF J. A. CALDER, D.L.S.

## SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA.

My survey work of the past season was begun on April 17 in tp. 17-25-6 where we did some retracement work and traversed the left bank of Thompson river through sections 3 and 4. This traverse was necessary on account of a large earth slide which took place on the opposite side of the river several years ago, changing its channel a quarter of a mile in one place. It is usually considered unsafe to irrigate elevated benches along Thompson river in this part of the dry belt, for should there be a substratum of clay, with a decided slope towards the middle of the valley, the seepage may give the normally rigid clay a greasy quality and thus cause the overlying mass of earth to slide.

Sections 1 and 2 of this township fall upon the side of a high rocky mountain between Thompson and Nicola rivers, near their junction, and with the exception of some fair grazing on the lower slopes these sections are of little value.

The climate and soil around Spence's Bridge are very well suited for almost all kinds of fruit and vegetables. Sheep raising has been attempted in a small way with fair success.

On April 30, I moved by wagon to Twaal creek, about five miles north of Spence's Bridge, and began subdividing in tp. 17-25-6. These surveys were continued into tp. 18-25-6, to include all the suitable land. The boundaries of Cook's Ferry Indian reserve No. 6 were retraced, and the monuments at the corners restored. This reserve extends along Twaal creek for about seven miles, and includes practically all the best agricultural land in the bottom of the valley. The elevation increases rapidly towards the source of the creek, with a consequent increased danger from summer frosts. A good pack-trail follows along Twaal creek with branches leading into Venables and Upper Hat creek valleys. The latter trail does not appear to be very much used, for it has become obstructed by windfall in many places.

I connected my surveys in Twaal valley with the earlier surveys in Venables valley, tp. 18-25-6, and retraced a number of old provincial lots there.

The chief industry in Venables valley is stock raising, for which it is well adapted. There are good hay lands in the valley affording winter feed, while the range land towards Twaal creek is utilized during the grazing seasons.

Upon the completion of the surveys in this vicinity, I left on July 6 for Botanie lake, in tp. 16-26-6, where I was instructed to survey such grazing lands as I deemed to be of value. Lytton Indian reserves Nos. 1 and 15, include much of the best grazing and agricultural lands around the headwaters of Botanie and Skunka creeks. These creeks are separated by a low divide about half a mile north of Botanie lake.

Subdivision was carried into tp. 17-27-6, in order to include some good range land in sections 12, 13 and 24, and connect with earlier surveys on Lahuwissin creek. Some bench land at the forks of Lahuwissin creek, tp. 17-27-6, was also surveyed. This is excellent agricultural land, but as is usual with small streams in the dry belt, all the available water in the creek is already recorded. This is a condition general to the dry belt and the remedy, equally general, is in this instance furnished by Pasulko lake at the head of the south branch of the creek, which forms a splendid reservoir for storing the copious freshet waters of the early spring.



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Botanie lake, a little more than a quarter of a mile long, is well stocked with trout, and is a favourite camping place during the summer for people desirous of escaping the heat of Lytton. While we were there a survey was being made for the purpose of increasing the storage capacity of the lake for irrigation. A portion of Skoonka creek is now diverted by a ditch into Botanie lake.

From Lytton, a good wagon road has been graded to within four miles of Botanie lake, and is passable by wagons to the south end of Pasulko lake, but it is soft in places during spring. Good trails radiate from this road towards Fraser river, Upper Hat creek and Spence's bridge.

On August 31 I left Botanie lake to establish the boundaries of the Nicola Forest reserve from Pimainus creek northerly through townships 17 and 18, range 24. I also completed the retracement of Cook's Ferry Indian reserve No. 9. Most of the sections surveyed in these townships are hilly and only suitable for ranching. There is a strip of fair bench land, between the forest and Indian reserves, south of Inkikuh creek which, although stony in places, should prove valuable if irrigated. Pukaist creek flows through a narrow ravine in sections 9, 15 and 16 in township 18, but farther up there are good benches and meadow land, some under cultivation, the principal crop being hay. An excellent wagon road, from Ashcroft to Highland valley, passes through the northeasterly corner of tp. 18-24-6. A branch of this road leads to Spatsum, but it is ungraded and very rough and steep. A good pack-trail from Toketic follows Pukaist creek. I moved my outfit over this trail to the wagon road.

On October 1, I moved to Barnes lake where six miles of the boundary of Nicola Forest reserve were run, a portion of Oregon Jack Creek Indian reserve No. 6 retraced and some subdivision made in townships 19 and 20, range 24. Only the imperative work was done in these townships, as I was anxious to finish as many as possible of urgent surveys before closing down for the season.

On October 13 I took train at Ashcroft for Savona, where we crossed Kamloops lake, to the mouth of Copper creek, in a gasoline launch. From there we travelled by wagons to our next camp on Frog creek in tp. 22-20-6. A graded wagon road has recently been built along Copper creek from its mouth to near the south end of Red lake. A continuation of this road goes to the settlements on Criss creek, but it is very rough, being graded only where essential to make it passable for wagons.

The portions of townships 22 and 23, ranges 20 and 21, outside the Tranquille Forest reserve, along Frog creek, were subdivided for settlement. This country is elevated, rolling and well wooded with fir and jackpine. There is some good bottom land near Frog creek, and patches of hay meadow are scattered through the lands surveyed. The elevation is too high for most crops but hay. Deer, grouse and rabbits abound.

Upon the completion of these surveys I returned to Savona on October 29 and discharged the party. Taking my assistant, I then proceeded to Gladwin, in order to make a small correction survey. This was completed on November 4.

The season was quite favourable for the work. The months of July and August were very dry, and the smoke from many forest fires at times proved embarrassing.



## APPENDIX No. 21.

## ABSTRACT OF THE REPORT OF W. CHRISTIE, D.L.S.

## SUBDIVISION SURVEYS NORTH OF ATHABASKA.

On May 21, 1914, I left Athabaska with my party and proceeded by boat up Athabaska river to Bald hill in tp. 69-23-4. From there we had to cut a trail northerly to our work around Calling lake.

Another route to reach this district from Athabaska is by the Peace River Crossing road as far as tp. 71-24-4 and thence easterly along the trail from the "Fish Camp" on Athabaska river to Calling lake. A third route follows a trail down the Athabaska to the mouth of Calling river in tp. 70-19-4, thence up the river to Calling lake. The trails on all these routes are almost impassable for wagons, but this season a settler in tp. 70-22-4 cut out the pack-trail which I had made from Bald hill into a wagon trail. The trail from the mouth of Calling river to Calling lake is passable for wagons with light roads during a dry season.

Calling lake, which is situated in townships 71 and 72, ranges 21 and 22, is about ten miles long and six miles wide. It has a stony and gravelly beach except at the southeast end where the shore is sandy. It abounds with whitefish, the catching and marketing of which forms one of the principal industries of this district. Calling river, which is the outlet of the lake, is about fifty feet wide, from three to seven feet deep and flows with a very rapid current. From tp. 71-20-4 to its mouth it is a succession of rapids. Water-power could easily be developed as the valley is narrow and from one to two hundred feet deep throughout most of its course.

South of Calling lake the country is rolling and heavily timbered with poplar, birch and spruce. The spruce is fairly large but very scattered and therefore not of commercial value.

In some areas which have been overrun by fire, and where the timber has been burned off, luxuriant grasses grow, but hay is not abundant except along the creeks flowing into the lake in tp. 72-21-4. Clay ridges with intervening muskegs are frequent, and the land when cleared would no doubt produce good crops of cereals and vegetables.

A small half-breed settlement is located on the northeast shore of the lake. These settlers have some cattle and horses and cultivate a small amount of land.

The muskegs in this district could be easily drained as they are shallow and approach very close to the valley of Calling river, and to a number of creeks.

Petroleum claims have been staked out along Calling river, but no development work has been done. The clay along the banks presents a dark oily appearance.

Game, both large and small, appears to be plentiful in the district. Moose, deer, bears, rabbits, ducks, prairie chickens, partridges and fur-bearing animals such as foxes, coyotes, muskrats, mink and ermine were seen. Fox farms have been started along the Athabaska and the industry appears to be proving a success.

I closed operations on October 31, and returned to Edmonton.



## APPENDIX No. 22.

## ABSTRACT OF THE REPORT OF G. W. COLTHAM, D.L.S.

## STADIA SURVEYS IN ALBERTA.

The season's work which consisted of the investigation and stadia survey of water courses commenced on June 15, 1911, and lasted to the middle of October. During the summer, surveys were completed in twenty-seven townships, comprising generally the area from range 9 to range 14 and from township 43 to township 47, west of the Fourth meridian.

The northern part of this area is nearly all occupied by settlers, but only a small part is under cultivation, as owing to the hilly nature of the country ranching appears to be more profitable than farming. Camp lake in tp. 48-11-4 is the only fresh-water lake in the vicinity, and is partly supplied by surrounding springs. Loranger lake, only a few chains farther north, is of an entirely different character; it contains alkaline water and is of a much greater depth.

The land in the central portion, though rolling, is not unsuitable for cultivation, and produces good crops of wheat, barley and oats. However, this part is only recently homesteaded, and the area under cultivation is small.

Towards the west and south the area under cultivation is larger than to the east, and the yield of wheat in some cases was forty bushels per acre. The soil is a clay and sandy loam.

Many coulees run through the eastern part and only the land in the valleys is suitable for grain. The higher portions afford good pasture for cattle and horses.

Throughout the whole area investigated wood is scarce, and is usually only obtainable around the shores of the lakes. The largest timber seen was some poplar about twelve inches in diameter around the shores of lakes in tp. 43-11-4. Soft coal is used for fuel by the farmers. Indications of coal appear throughout the district, but no deposits of commercial value have been discovered.

Very little surface rock is to be found; some loose stone and thin deposits of shaly rock are found in the northern part.

Nearly all the lakes contain alkaline water; they are shallow and seem to maintain a fairly uniform level. A few lakes in the central part have dried up considerably during the last few years.

Small game, such as rabbits, ducks, partridges and muskrats are plentiful, and at one place a dam was built across Battle river by beavers, though none were seen.

The weather during the summer was fine, and the rainfall sufficient for the maturing of crops. No damage was done by summer frosts this season, though the district is subject to them.

Battle river, which flows through the southwest corner of this area, is approximately two chains wide with a current of about two miles per hour. No rapids or falls were seen from which power could be developed. The banks, chiefly clay with sand and gravel in places, rise abruptly to a height of ten or fifteen feet. The river valley, which is very fertile, is quite level and varies from twenty chains to nearly a mile in width. In places it is covered with a thick growth of small poplar.



## APPENDIX No. 23.

## ABSTRACT OF THE REPORT OF J. M. COTE, D.L.S.

## RESURVEYS IN CENTRAL SASKATCHEWAN AND ALBERTA.

We began the season's surveys about May 20, by investigating some river lot monuments along South Saskatchewan river in tp. 20-1-4 and tp. 20-2-4. These townships are fairly well settled, and farmers seem to be doing rather well.

We then left for townships 22, ranges 10 and 12 and townships 21, ranges 11 and 12 which I was instructed to resurvey. For the greater part of the way I followed the trail along the Swift Current-Bassano branch of the Canadian Pacific railway, then under construction. Red Deer river cuts all four of these townships.

The north side of the river is well settled, but unfortunately crops have not been good for the last few years, due to the light precipitation. With the exception of a few springs in Berry creek valley, in tp. 22-12-4, water is very scarce, most of the settlers having to haul it from the river. The water in the Government-drilled well, at the northeast corner of tp. 21-11-4 is alkaline. The worst part of Dead Lodge canyon, in the valley of Red Deer river, lies in the latter township. In this canyon valuable fossils are found, and from a geological standpoint this region is very interesting. Indications of oil have been found.

Upon completion of the resurvey of these four townships, I proceeded on June 26 to Pakowki lake in townships 4 and 5, ranges 7 and 8. The road allowances which I followed run through a thinly-settled country, and the crop prospects in this region were poor.

Owing to continued droughts extending over the last three years, Pakowki lake was this year free from water. As the lake has a large watershed, and no outlet, it will no doubt, refill at the first wet season. The subdivision which I was instructed to do, was therefore produced as far as the well-defined shore line.

A number of settlers have taken up homesteads in the vicinity of the lake. The general lightness of the soil together with the dry climate, and the conditions above described generally prevailing in this district, would seem to indicate that in order to make a success of agriculture, dry farming operations solely should be practised. This district, however, is better adapted for ranching purposes, though the water is more or less alkaline.

After completing these surveys I proceeded to Cygnet lake, near Red Deer, which, according to reports, had been drained by the Alberta Central Railway company. Upon investigation, however, I found that the railroad grading was completed across the lake and that drainage operations had been abandoned. We, therefore, traversed the lake and produced certain subdivision lines.

Excepting those parts cleared by farmers, this well-settled, rolling country is covered with poplar, some of which measure ten inches in diameter. There is ample precipitation and crops are usually good.

On July 25, I started for tp. 54-19-4 which we resurveyed. The western part of the township is rolling and covered with poplar up to fifteen inches in diameter; a few scattered spruce were also seen. The eastern part is more open and well settled. The soil generally is clay loam and crops are good. There are four lakes and many sloughs in the township, and water is fresh and plentiful.



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This work was completed on September 5, when we moved to townships 51, ranges 23 and 24, west of the Third meridian, which we partly resurveyed. The only road available is the one along the main line of the Canadian Northern railway, and as the first part of the month was very wet, the roads were heavy and progress was slow.

Saskatchewan river crosses these two townships, which are covered with patches of willow scrub and poplar, some of the latter measuring twelve inches. The land is rolling, with the exception of that part of township 51, range 24, which lies south of the Saskatchewan, and those lands held by railway or land companies, these townships are well settled and generally the crops are good. Ranching has been carried on very successfully for a number of years. Good hay can be procured around the numerous lakes and sloughs, but with the exception of that in the river, all the water to be found is hard and more or less alkaline. In this region game of various kinds is quite abundant, consisting of moose, deer and a great number of wild geese, ducks, prairie-chickens, partridges, rabbits, etc.

The resurvey of tp. 51-24-3 and the south third of tp. 51-23-3 was made, but a deep fall of snow prevented the completion of the resurvey of the latter township, as the monuments which hitherto had been hard to recognize could not then be found.

I stored my outfit, discharged my men, and left for Ottawa on November 19.



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## APPENDIX No. 24.

## ABSTRACT OF THE REPORT OF G. C. COWPER, D.L.S.

## STADIA SURVEYS IN SOUTHERN SASKATCHEWAN.

The survey work on which I was engaged during the past season consisted of stadia traverses of permanent lakes over five acres in area, and of rivers over one chain in width, the investigation of sloughs and dried-up lakes and the extension of the subdivision lines over the dried-up area.

On June 4, I began the season's work on a block of thirty townships north of Maple creek.

On account of the light snowfall last winter, and the abnormal drought in the spring and early summer, I found all the lakes in this district to be dry. Some of these lakes in ordinary years are said to have from three to five feet of water, while others dry up practically every year. A number of these lake beds are now producing hay, while others are composed of soft, wet alkaline mud which does not produce vegetation and which very seldom becomes dry. The lake beds which appeared to be dry only on account of the abnormal season, and which were of no value for agricultural purposes, I traversed, while those which were producing vegetation were not traversed.

The principal lake in this block is Bitter lake in township 13, range 28, and townships 13 and 14, range 29. This lake is about twelve miles long, and varies in width from one mile to a couple of chains at the narrows in section 29, range 28. There is a bridge across the narrows, and this saves the settlers to the north a long haul around the lake to get to the railway. Bitter lake was practically dry at the time of my survey, but its bed consists of soft, wet alkaline mud which never becomes hard.

Many Island lake in townships 13 and 14, range 1, was, at the time of the original survey, a large body of water about seven miles long and six miles wide. This lake has been drying up for a number of years and all that now remains is four small sloughs, and even these sloughs were dry this year. These sloughs have a sandy bottom with the shore line poorly defined, but they will likely fill up again. The remainder of the old bed is mostly gently rolling prairie, covered with a good growth of grass.

This block of townships is mostly rolling prairie, ranging from almost hilly in some townships to gently rolling in others. The soil is mostly a sandy loam with clay subsoil, and is well suited for the growing of grain and vegetables. Good water is obtained at a depth of twenty to fifty feet.

The great drawback to this district for farming is that it is in what is known as the dry belt and one is never certain of sufficient moisture. This whole block is very well settled and practically every quarter-section of value is either filed on or leased. A large number of the settlers are Germans from North Dakota, but there are also a number of Canadians and Americans. This district has only been homesteaded for about five years; previous to this it was considered a ranching country, and there are still a number of ranchers left. The district has made rapid strides; schools and post offices are to be found in practically every township, while there are some prosperous villages on the main line of the Canadian Pacific railway which runs through townships 11 and 12 across this block. A number of the road allowances are graded and the old trails have become fenced off.



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The future of this district depends almost wholly on the rainfall: with sufficient moisture the district will be prosperous. The crops this year were a total failure on account of the long drought, but, far from being discouraged, the settlers are confident of the future and were making their plans for an increased acreage next year.

There is no wood or fuel in this block, and the only wood available is in the Cypress hills to the south and in the sand hills north of Big Stick lake to the east.

The investigation of this block occupied us until July 24, when I returned to Maple Creek and started to work east through townships 11, ranges 24, 25, 26, 27, 28 and 29. These townships are at the foot of the Cypress hills and, with the exception of townships 11, ranges 25 and 26, are highly rolling prairie and are more or less broken by several creeks.

The beds of the lakes in these townships were also found to be dry. A number were producing hay, while others were soft, alkaline mud.

These townships are well settled and are in close proximity to the main line of the Canadian Pacific railway. One very noticeable feature was that as soon as we started east from Maple Creek the crops appeared better, especially the wheat crop.

On reaching range 21 I turned south to township 7, range 20, and worked north through range 20 to Gull lake. The Cypress hills in township 11, range 21, take the form of an escarpment from 200 to 300 feet high. On top of the escarpment the country is gently rolling, but where creeks are encountered the valleys are wide and deep and usually have bush along their sides. On reaching the top of the bench it was at once apparent that the upper level had received more rain than the lower. Hay stacks were to be seen in all directions, while wheat and oats were much better. This part of the country is also well settled, the majority being Americans.

The Weyburn-Lethbridge branch of the Canadian Pacific railway runs through township 8 so that this part of the country is well served with railway facilities. I reached Gull Lake on August 22, having finished the investigation of townships 7, 8, 9, 10, 11 and 12, range 20, and townships 11, 12, 13 and 14, range 19. In these townships a few small lakes were encountered which carry water the year round, but the majority were found to be dry.

From Gull lake we worked east to Swift Current, and completed this block of townships as far south as township 11. We arrived at Swift Current on September 11.

In these townships several permanent lakes were traversed. The most important of these is lac Pelletier, in township 12, range 15. This lake lies in a valley about a mile wide and 150 feet deep, and the lake is about three miles long and from one-half to three-quarters of a mile wide. The water is fresh, cool, and well stocked with fish. The shore is well defined and covered with loose stones. The greatest depth found was thirty feet. A small summer resort was started last summer on the east side of the lake and as the lake is a convenient distance from Swift Current the resort should be well patronized.

Up to the time we reached Swift Current the weather had been very dry and hot, but on September 12 we had a heavy rain which turned to snow and lasted without interruption until the 14th.

The next block of townships investigated was composed of townships 11 to 14 in ranges 8 to 13 inclusive. This block is rolling prairie and is very well settled. The majority of the settlers are homesteaders, but there are still a number of ranchers left. These townships are served by the branch of the Canadian Pacific railway which runs from Swift Current southeasterly to Vanguard in township 11, range 10.

Townships 13 and 14, ranges 12 and 13, are all taken up by Mennonites of Russian nationality. These people live in villages and work their farms from the village. These villages or communities vary from three or four houses to a village with a street a mile long with houses on both sides. Each family have a large house and barn combined and a garden of about five acres. Usually there is a church, school,



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and blacksmith shop. In one of these villages in which I camped they had a concrete tank and windmill supplying running water to all the buildings.

In this block of townships I found no water areas to traverse, with the exception of a small slough in township 11, range 8. The crops in this district were better than those farther west, wheat yielding from five to twenty bushels an acre, the latter on summer fallow. Oats and flax, however, were very poor and very little of it was threshed.

I completed the investigation of this block on September 30 and returned to Swift Current.

My next work was to traverse South Saskatchewan river in townships 22 and 23, range 19. On the move from Swift Current to these townships I was greatly delayed by wet weather. I reached Cabri, a town on the Swift Current-Bassano branch of the Canadian Pacific railway in township 19, range 18, on October 3 and was held up there until the 8th on account of the almost impassable condition of the roads due to the heavy rains. During this time I was able to investigate Boggy lake in this township.

I reached township 23, range 19 on October 9 and commenced the traverse of the river in this township and in township 22, range 19.

The river runs through the southerly part of township 23 and through sections 35, 36 and 25, township 22. It varies from one half to a mile in width and is full of sandbars and islands. Fifteen islands were traversed in township 23 and two in township 22. The largest of these islands is four miles long and half a mile wide while the smallest one is less than half an acre in area. They are mostly covered with a dense growth of small poplar, willow and birch and buffalo berry bushes; in places they have steep cut banks from six to twelve feet high. The valley of the river runs back for about a mile on each side but the slope is gentle and the top of the valley is not more than 200 feet above the river.

The older settlers are ranchers and the new ones homesteaders. The homesteaders however have not been settled long enough to have any crops. I completed the traverses in these townships on October 21, after which I moved to Maple Creek and disbanded my party.

During the season I completed the investigation and traverses in ninety-three townships and partially investigated a number of others. I also erected forty-four monuments which had not previously been located.



## APPENDIX No. 25.

## ABSTRACT OF THE REPORT OF A. L. CUMMING, D.L.S.

## SUBDIVISION SURVEYS NEAR PEACE RIVER CROSSING.

Having completed the organization of my party at Edmonton, we left for Peace River Crossing, near which place my work lay, arriving there on May 11, 1914.

We began subdivision in tp. 83-21-5, as about twenty squatters were located there waiting for a surveyor to accept their statutory declarations. Most of these settlers are located in the southwest part of the township, where there is a plateau about six square miles in area. Peace River Crossing is located in the northwest corner of the township, and the growing importance of this settlement has no doubt attracted settlers to the locality. The small gardens put in by the settlers last year gave good results, and prove that the soil is fertile. Most of the land settled on is covered with light poplar and willow, but it can be easily cleared.

The western portion of the township is cut up by the valleys of Peace and Smoky rivers which are from 500 to 700 feet deep and from one to three miles wide. Peace river is about 1,800 feet wide at the Crossing, and is navigable for steamers. .

I also made subdivision surveys in tp. 84-20-5, tp. 82-21-5, tps. 82 and 83-22-5 and tp. 82-23-5, all of which were completed by November 1. The land in these townships is similar to that in tp. 83-21-5, but it is not so eagerly sought after owing to its greater distance from Peace River Crossing.

I returned to Edmonton, discharged all my party except two men and left for Swan River district south of Lesser Slave lake. This is a choice farming district but the best of the land is in the Indian reserves.

After performing some miscellaneous work on Moose, Driftwood and Salteau rivers I returned to Athabaska district, where I made two small correction surveys.

We closed operations for the season on December 20.





Photo by F. V. SEIBERT, D.L.S.

#### TRACKING SCOW TO FOOT OF GRAND RAPIDS—ATHABASKA RIVER.

After running through the right channel, the scow is caught by the eddy, just below where the two channels meet. A line is attached to a float or log which is thrown into the left channel and after being carried into the eddy is picked up by the crew and fastened to the bow of the scow. The men on the island then pull the scow up to the landing where it is loaded.



Photo by F. V. SEIBERT, D.L.S.

#### SCOW GOING OVER CASCADE RAPID—ATHABASKA RIVER.

At low water the drop is about six feet and scows have to be unloaded and run over empty. At high water the drop shows only as a large wave, and scows go over the rapids fully loaded. A rope from bow to stern over some bales of hay in the centre, which act as a strut, relieves the strain on the scow, and prevents it from being broken in two.







## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF W. J. DEANS, D.L.S.

## INSPECTION OF CONTRACT SURVEYS IN MANITOBA AND SASKATCHEWAN.

Our first work, which was begun on March 27, 1914, was the inspection of contract No. 24 of 1913 west of lake Winnipegosis.

On our route thither from Winnipegosis we passed some fine homesteads between Pine creek and Duck bay, in tps. 36 and 37-20-Pr. The surface is rolling and covered with a thick growth of poplar and willow with clear spaces throughout the district. The soil is a rich black loam and well adapted for agricultural purposes. There are many hay meadows which ensure an abundance of feed for cattle, and the water in the streams and sloughs generally is good. There is plenty of fish in the lake and game is plentiful. Employment may be obtained in the winter from the fish companies which prosecute the fish business with great energy.

The lands included in this contract, which lies immediately north of Duck bay, are generally low and flat. There are many muskegs, lakes, and tamarack swamps separated by poplar ridges of fairly good land. The timber on the ridges is only suitable for building purposes and fuel. There are many places throughout this part suitable for cattle raising, hay and water abounding.

This work was completed on April 4. I then disbanded the party and returned to Brandon until after the spring break-up.

On July 11, I left Brandon with a small party for Madge lake, fifteen miles north-east of Kamsack in Duck mountains. My work here was to lay out a summer resort near the southeast corner of the lake. This lake is about three miles in length and about the same in width with numerous deep bays and small islands. In many places there are fine sandy beaches sloping back from the water for a distance of thirty feet. The higher ground is mostly covered with poplar. The crowd visiting this lake is very cosmopolitan in character; they do not all come for pleasure. Many come to fish and are well rewarded for their efforts, and some come to pick raspberries which grow in profusion on the islands. There is a good road nearly all the way from Kamsack to the resort, though the last mile or two is a little rough on account of stumps sticking up above the surface.

From there we went to St. Ambrose a settlement north of Poplar Point where a number of squatters had settled on sec. 11, tp. 15-5-Pr. This section was subdivided in such a manner that each squatter retained all his improvements. The land is very stony except the northwesterly part which is hay land. The squatters are engaged in raising a few head of cattle, and fish and hunt in the winter. I completed this work on August 28 and moved to Grand Rapids where I arrived on September 5, having travelled by steamer from Selkirk.

Our work at Grand Rapids was to survey a number of lots for settlement and to investigate the claims of squatters.

When this was completed we left by steamer for Manigotagan, intending to get off the steamer at Gull harbour or Hecla, but on account of rough weather the captain would not run into these places, so we were carried to Selkirk, where we arrived on October 3.

From there we returned by boat to Little Black river to examine contract No. 27 of 1913, which we completed on October 14, and the next day moved the party to



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Manigotagan to examine contract No. 26 of 1913. We completed the examination of this contract on the 22nd. After completing the work at Manigotagan, we had great difficulty getting out, but finally took passage on a tug called the *Amisk* which landed us safely in Selkirk, having taken forty-eight hours to travel about one hundred miles.

On October 30, I went to Portage la Prairie to get my outfit which I had left there in the spring, and on November 3, shipped it by the Canadian Northern railway to Shellbrook, Saskatchewan, at which place it arrived on November 9.

From there I left with four teams for contract No. 13 of 1911, which we reached on November 22, and completed the inspection on the 26th. We then started out to inspect contracts Nos. 12 and 21 of 1911. These contracts are situated about fifty miles north of Witchekan lake. The Green lake trail runs through one of these contracts, but we found this trail in a very bad state. In addition to carrying oats for the horses, we now had to carry sufficient hay from the Witchekan Lake settlement to do the horses while inspecting these contracts, and as the hay was loose and the trail through the bush very narrow we had considerable trouble and delay.

We completed the inspection of these two contracts on December 15; we intended to go across the country to Meadow lake in tp. 59-16-2, but could not do this on account of the streams and lakes not being frozen hard enough to carry teams. We therefore, had to take the longer trail around by Green lake. The trail on the west side of the lake is so steep that we had to let the sleighs down by means of a rope snubbed around a tree. On the east side of the lake, however, the trail is good. The country is covered with a growth of poplar, birch and willow. The surface is nearly level or gently rolling and the soil is good black loam. There are no white settlers in the district.

We arrived at the town of Green Lake on December 17 and spent one day repairing the racks of the sleighs which had got badly damaged owing to the rough road. We then proceeded to Meadow lake and thence to Beaver river in contract No. 26 of 1912 where we arrived on the 20th.

In addition to the inspection work required in this contract we had to traverse Beaver river through tp. 61-16-3, Meadow river through sections 4 and 9 in the same township, and a small lake in township 60. We completed the inspection and traverses on January 4, 1915.

The country between Green lake and Meadow lake is rolling and covered with poplar on the good land and jackpine on the sandy ridges. There is considerable land through this district suitable for farming purposes and ranching. We did not see many settlers in this part, and what few we did see are engaged in cattle raising. There is an abundance of hay all along Beaver and Meadow rivers which makes this part well adapted for that purpose. Many settlers were engaged in fishing at Waterhen lake during last winter and met with great success, a ready market being found at points along the railway.

On January 5, we started for Mervin in tp. 50-20-2, the nearest point on the railway, and arrived there on the 7th.

Between Meadow lake and Brightsand lake there is an extensive country without many settlers. The surface is gently rolling and covered with poplar, birch and willow with bluffs of spruce and tamarack. There are many open spots and numerous streams and small lakes; hay is plentiful throughout the district. The soil varies from a rich black loam to sandy loam. There is a good supply of building material and plenty of wood. The only drawback is the lack of railway facilities, and this will in all probability soon be supplied.

On January 9, we shipped the outfit to Winnipegosis, and on the 18th left there to re-inspect contract No. 13 of 1912. We completed this work on the 26th, and on the 30th arrived back in Winnipegosis. From there we travelled across lake Winni-



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pegosis and lake Manitoba to tp. 32-13-Pr. We had two small corrections to make in this township, and while my assistant was making these the rest of us were engaged in making a trail to Proulx lake, in township 33, range 13, where corrections were necessary. We moved camp to this township on February 11. This lake is about five miles in length and one half mile in width; the shores are generally low with hay meadows, but in a few places poplar bluffs extend nearly to the water. There is some good land around the lake and any amount of hay. There is also sufficient timber for fuel and building purposes, for many settlers. Fur-bearing animals, such as wolves, mink and muskrats seem to be numerous. While in this camp we examined a portion of contract No. 25 of 1913, and the remainder was examined from a camp in tp. 33-12-Pr. The land throughout this contract is nearly level or slightly rolling and covered with a thick growth of poplar, willow and tamarack, with many hay sloughs and muskegs. There are, however, many sections which are well adapted for cattle raising. The soil is sandy loam on the higher levels and a deep black muck in the lower places. There are many places which could be cleared with very little labour, but there are no settlers in the district, as it is too remote from railways to attract them.

On February 19, we started for contract No. 20 of 1914 by way of Fairford and Gypsumville. This route took us considerably out of our way, but the snow was so deep that a more direct way was impracticable. We arrived at tp. 34-9-Pr. on the 23rd. Between Gypsumville and the southerly boundary of this contract there is a large area of good land. The country is gently rolling and covered with a thick growth of white poplar from six to eighteen inches in diameter, very tall and straight. The soil is a good black loam; this area of good land extends to about the middle of township 34, range 9. Most of the land in this district has quite recently been taken up, but there are still some good quarters suitable for cattle raising. The settlers have until recently found a ready market for cordwood at Gypsumville, but on account of the depression there was very little sale of wood this season: this, however, did not deter many of them from making extensive clearings which they no doubt intend to crop.

On February 28, we moved the outfit to Gypsumville, and on March 2 shipped part of it to Riverton and part to Lac du Bonnet.

At Winnipeg I divided the party, sending my assistant with some of the men to Lac du Bonnet, from which place they went to Bird river by sleigh, and examined contract No. 28 of 1913. I went with the remainder of the party to Riverton, thence by sleigh up lake Winnipeg to contract No. 21 of 1914. We inspected this contract, and on March 15 moved to Winnipeg and met the rest of the party from Bird river.

The land in contract No. 28 of 1913 is largely rock ridges, with tamarack swamps, hay meadows and small lakes, but there is some timber suitable for building purposes and cordwood.

The land in contract No. 21 of 1914 is generally level and covered with a thick growth of poplar, tamarack, birch and willow. There are many good homesteads along the shore of lake Winnipeg. In places the land is nearly clear so that little labour would be required to bring it under cultivation.

Riverton the terminus of the Winnipeg Beach branch of the Canadian Pacific railway is quite a thriving place and is the station to which many of the fishermen bring their fish for shipment to Winnipeg. About four hundred cars of fish were shipped from this station last winter.

On March 17, we started for Mafeking to inspect a contract in that vicinity. In addition to the inspection work we made a traverse of Moose creek and Steeprock river. This work was completed on March 27. I then proceeded to Dauphin where the party was discharged. Steeprock river rises in the Porcupine mountains and flows easterly through tp. 44-25-Pr. This stream spreads out and is lost in willow and



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tamarack swamps; it probably finds its way into Moose creek by underground channels, and by two visible outlets from a large marsh on sec. 10, tp. 44-25-Pr.

The waters of Moose creek in many places are highly impregnated with salt, so much so that if a stick is dipped into it and withdrawn it will be found to be encrusted with fine white salt. The bushes along the stream in many places are white where they come in contact with the water. There are some good homesteads available along the line of the Canadian Northern railway near Mafeking. The land is covered more or less with bush, but it is good black soil and much of it dry, and could be cleared with little labour.

The bush lands of Manitoba around the lakes offer the settler good inducements, such as good land, any amount of fuel and building material, and abundance of hay, good water and plenty of large game. In winter time employment may be obtained from the fish companies or in logging camps.

My work took me over an extensive area of the western country, and I noticed that the settlers around the lakes were in the most prosperous condition.

The weather conditions last winter for carrying on field operations were good, not too cold and little snow except around the lakes.



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## APPENDIX No. 27.

## ABSTRACT OF THE REPORT OF S. L. EVANS, D.L.S.,

## MISCELLANEOUS SURVEYS IN SASKATCHEWAN.

The miscellaneous work on which I was engaged during the season of 1914 consisted of the laying out of roads at Madge lake, the subdivision of lots at Clear lake, the resurvey of tp. 39-13-3, tp. 16-21-3 and tp. 23-23-3, and several small surveys in the Coteau hills.

Madge Lake summer resort lies on the south shore of Madge lake, about twenty miles northeast of Kamsack, Sask., a thriving town of 1,200 inhabitants on the main line of the Canadian Northern railway. The country in the vicinity of this resort is well timbered with small spruce and poplar. A partly graded road runs from Kamsack to the lake, but the last eight or ten miles of it is a bush trail which has only recently been widened out by the forest ranger stationed at Madge lake. It is the intention in the near future to grade this latter part of the road, and when completed there will be a first-class road from Kamsack.

Clear Lake summer resort, which we next subdivided, is located in sec. 33, tp. 19-19-Pr., and lies on the west shore of Clear lake. The nearest station is Erickson, a small village on the Neepawa-Russel branch of the Canadian Northern railway. The lake is about twenty miles northwest of Erickson, and is connected with it by a fairly good summer trail. It is a beautiful clear body of fresh water five or six miles in width and abounds with whitefish and pike.

Our next work was the resurvey of tp. 39-13-3. This township lies about thirty-five miles northeast of the town of Perdue, Sask., and is in the Eagle hills. The township on the whole is very hilly and wet, having numerous small sloughs and lakes, and is for the most part covered with dense small poplar. A few of the homesteads have been taken up and where crops have been put in, wheat and vegetables have grown successfully. Most of the lands owned by railway companies are still vacant. The country to the east of this township is an excellent grain-growing district, and contained the best fields of wheat seen during the season.

On completion of the above township, we drove across country to tp. 16-21-3, a distance of over two hundred miles. On the trip we passed by way of Perdue, Harris, Rosetown, Alrose and Saskatchewan Landing.

The country as far as Rosetown is settled with a good class of settlers, and the splendid farm buildings evince prosperity. From Alrose to Saskatchewan Landing, a distance of forty-five miles, the district has been partly homesteaded in the last few years. The crop this year was almost a complete failure, having suffered from the continual drought throughout the summer.

The work in township 16, range 21, was completed August 27, and our next work was the resurvey of tp. 23-23-3. South Saskatchewan river touches the northwest corner of this township. Two-thirds of the township is hilly prairie, and most of the best homesteads have been taken up. The new Empress branch of the Canadian Pacific railway affords good shipping facilities for the settlers. This year the crops were poor on account of the drought, which was general throughout the southwestern part of the province.

This work was finished on September 21, and the dry bed of Luck lake in township 24, ranges 8 and 9, was next subdivided. This lake, which has dried up in the



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last few years, is covered with a thin coating of alkali. Grass is gradually covering the lake bed, and in time these lands will make pasturage and hay lands. The surrounding district is well settled, and grain growing is successfully carried on, but only a half crop was obtained this year. A new branch of the Canadian Northern railway running south from Macrorie through the Luck lake country is being built and will give the farmers better shipping facilities.

From October 5 to the 17th, we were engaged on several small miscellaneous surveys in township 26, range 8, townships 25 and 26, range 9, and township 26, range 10. These townships are all in the Coteau hills, and for the most part are hilly prairie. Most of the best quarters have been taken up, and good crops have been grown; this year the crop was only fair. I closed operations and returned to Calgary on October 31.



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## APPENDIX No. 28.

## ABSTRACT OF THE REPORT OF S. D. FAWCETT, D.L.S.

## SETTLEMENT SURVEYS IN THE NORTHWEST TERRITORIES.

The settlement surveys on which I was engaged during the summers of 1913 and 1914, lie along Athabaska river, Great Slave lake and Mackenzie river.

Having completed our organization at Edmonton the party proceeded by rail to Athabaska and thence by a ten-ton scow down the river to McMurray, reaching the latter place on May 19.

As one travels north from McMurray the high hills gradually dwindle away and finally disappear as lake Athabaska is reached. The country south of the lake is an unbroken swampy plain as far as one can see. The north shore is rocky.

What we saw of the north shore of lake Athabaska is rock, and there is very little land close to the lake which is fit for agricultural purposes. As we entered Rocher river however the country assumed a different aspect, and some large stretches of partly open rolling land were noticed. We passed there on June 1 and the grass was even then from two to three feet in height. This land is available for ranching or farming purposes and is easy of access.

We had to row our scow forty miles down Rocher river as the water from Peace river was beginning to back up into lake Athabaska. It is not uncommon to have to track a scow down Rocher river about the first week in June. If the right bank of the river is followed at the points where rapids are shown on the maps, no danger to navigation will be encountered. In fact except for sand-bars and occasional blind channels no guide is necessary from McMurray to Smith Landing.

Slave river runs about four miles per hour and averages three-quarters of a mile in width. Its banks, excepting between Smith Landing and Fort Smith, vary in height from fifteen to thirty feet and in general are wooded with poplar and spruce. At intervals scattered clumps of spruce large enough for lumbering purposes were observed. The top soil exposures are generally a light clay loam and beneath this is a heavier clay loam subsoil. Smith Landing, where we arrived on June 4, is approached by following the left bank of the river from a point about three-quarters of a mile above it, as there is a strong rapid just at the settlement which nestles at the base of the high crescent-shaped hill.

A scow can be run down the numerous rapids on Slave river between Smith Landing and Fort Smith but we chose rather to portage everything by wagon as it eliminated the chance of losing our goods. It also saved time as several of these rapids necessitate the portaging of scow and goods, and at Mountain rapid the scow has to be hauled up a hill one hundred feet high by means of horses with block and tackle.

The road between Smith Landing and Fort Smith, about sixteen miles in length, is first class and freighters haul from twelve to twenty-five hundred pounds at the rate of three-quarters of a cent per pound.

Both Smith Landing and Fort Smith will no doubt soon be thriving towns, as all the land in the neighbourhood is very good, and it has been amply demonstrated that grain can be raised there successfully. Smith Landing will then form the landing and Fort Smith the shipping point for goods going north, while the opposite will be true for outgoing products. Power can be readily obtained from the rapids. It might also be worthy of mention that the Hudson's Bay company have a telephone system between



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these two settlements. Fort Smith is the head of continuous navigation to the Arctic ocean a distance of about fifteen hundred miles. The Hudson's Bay company have a stern-wheel freight and passenger steamer called the *Mackenzie River*, which draws about four and a half feet of water when loaded. This boat navigates the river very successfully and is seldom grounded. The Northern Trading company have a one-screw steel-framed steamer called the *Northland Trader* which carries freight and a few passengers, but as she draws six feet of water when loaded considerable difficulty is experienced in low water in navigating the shallows on Mackenzie river. This latter company have also two small tug steamers which operate on the Mackenzie. The *Mackenzie River* steamboat on her first trip leaves Fort Smith about June 25 and goes to Fort Macpherson. On her second trip she leaves Fort Smith about the first week in August but goes only as far as Good Hope. The *Northland Trader* usually manages to leave a few days prior to the Hudson's Bay company's boat, but goes only to Arctic Red river. She also makes two trips during the navigation season which commences about the middle of June and ends generally in the latter part of October.

We left Fort Smith too early for either of these steamers and had drifted down Slave river about sixty miles when we were overtaken by a fishing tug travelling to Resolution. We were fortunate in getting a tow from her and reached Resolution on June 13.

Farming on a small scale is undertaken there by the members of the Roman Catholic mission and they have been able to raise wheat and oats successfully. All vegetables excepting tomatoes and melons are as easily grown as elsewhere, attain a good size and are of good quality. They have also a small herd of cattle and as considerable improvements have been made, we laid out the land for which they asked. They have also a well equipped saw-mill about four miles north of the settlement on Slave river, from which they ship shingles and lumber to their various stations on Mackenzie river. The remainder of the squatters are engaged in gardening only, so the lots were laid out of sufficient size to meet their requirements. The settlers are mostly half-breeds and Indians who gain their livelihood by net, trap and gun. There is also a detachment of the Royal Northwest Mounted Police established at this post.

We had not completed the survey of the settlement when the steamer arrived at midnight June 30, but we struck camp, rushed our things on board our scow and were soon in tow of the *Northland Trader* across the crystal waters of Great Slave lake.

This immense lake teems with the finest whitefish and lake trout that can be found anywhere. Other species such as inconnu (so-called by the discoverer of Mackenzie river, who named them "inconnu" or "unknown"), pike, pickerel, grayling and sucker are very numerous. Whitefish weigh from three to ten pounds, and trout, inconnu and pike from three to fifty pounds. On account of the water always being ice cold their flesh is very firm and is excellent food. No doubt some day as transportation becomes easier the fishing industry will be developed.

A sandy beach forms the south shore of Great Slave lake and there is a little fringe of land close to the lake front which is fit for agriculture, but this rapidly merges into muskeg which will be of no commercial value till drained. The north shore is said to be rocky, gardens being made by the arduous labour of wheeling earth from wherever it may be found and spreading it out over the rocky surface.

There are deposits of galena located about thirty-five miles southwest of Resolution and about eight miles inland. They are reached by a very marshy trail in which one sinks knee-deep at every step. These deposits occur in limestone formation and will yield from five to ten per cent. Copper has been found on Big Island about half-way between Resolution and the eastern end of the lake. Perforated limestone containing pockets filled with a yellowish oil which burns freely, is often picked up on the shores of the lake and of Mackenzie river. Between the headwaters of Mackenzie river and the north arm of the lake there are considerable deposits of tar asphalt.



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On July 1 we arrived at Hay river where the steamer stopped a few hours to unload merchandise and then departed for the north. Wrigley harbour at the west end of Great Slave lake was reached at midnight of the same day and the steamer anchored till daybreak, as great care was necessary there in following the tortuous shallow channel. As it was, the boat ran aground soon after starting and remained aground most of the summer, so we continued our journey alone.

The Mackenzie is noted as one of the largest and grandest rivers in the world. Its waters are clear till they mingle with the muddy waters of Liard river at Simpson where they become a dirty greyish colour and remain so to Good Hope, our journey's end. Whitefish, pike, inconnu, pickerel, grayling and sucker are plentiful, while trout are numerous at Wrigley harbour. From that point the fresh-water herring run in shoals during the months of July and August and these are excellent food. The width of the river varies from one-half to two miles, but some of the lake expansions are much wider. The current seldom falls below four miles per hour and frequently attains a rate of eight miles in what might be considered rapids.

We passed Providence at midnight on July 2 and drifting on down the river arrived at Simpson on the afternoon of the 5th. We remained there till July 28 making a survey of the settlement. Simpson, in north latitude  $61^{\circ} 52'$  (approximately), is situated on an island at the mouth of Liard river. There is a surface soil of rich sandy loam generally eighteen inches in depth with a sandy clay subsoil. A large area of land, which will no doubt be of commercial value before many years, extends up Liard river into British Columbia. After many trials it has been amply demonstrated that oats can always be grown and that wheat is sure three times out of five, although it is liable to be slightly frosted. Vegetables do exceedingly well. Mr. Harris, the Indian agent there, informed me that in the fall of 1913 he took one hundred and twenty bushels of fine large potatoes from one-third of an acre of land. Tomatoes and melons can be raised, but it is necessary to start them under glass. Small fruits such as raspberries, blueberries and cranberries can be had in abundance throughout the Mackenzie district. The winters are long and severe, but on account of the length of the summer days plant growth is very rapid and, as no frosts occur till well on in August, plants are almost certain to attain full growth. There is always sufficient rainfall to maintain the crop. The Department of Indian Affairs have a saw-mill established there, which is proving a great benefit to the settlers as it supplies them with shingles and lumber at a small cost.

We laid out thirty-eight lots of various sizes according to the needs of the settlers, and I do not think there will be any further surveys required for some time unless a gold rush occurs.

In the spring of 1914 a French prospector took a scow load of miners' utensils and supplies up Liard river from Simpson to commence operations on a gold claim he had discovered during his explorations there in the summers of 1911 and 1912. He was accompanied by four helpers but we could not find out where the deposit was located or of what extent it was.

About eighty miles below Simpson the general westerly direction of the river turns abruptly to the north where the Nahanni mountains, a spur of the Rockies, bars its westward progress. There the river seems to have cut its way clean through the mountains and two gigantic rocky cliffs resembling Gibraltar stand guard over the unexplored treasures of North Nahanni river. From that point northward the scenery along the Mackenzie becomes much more beautiful.

We arrived at Wrigley on July 30, having spent thirty-six hours on the trip from Simpson, a distance of one hundred and sixty miles. This settlement is merely a trading post and no attempt whatever has been made at farming, the squatters contenting themselves with the garden produce they raise. We therefore laid out only small lots to cover the claims of the traders and half-breeds and a few additional lots to cover any future claims. The people there are all half-breeds and Indians.



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We left Wrigley on August 12 for Good Hope, as we had decided to survey that place next and track back up the river to Norman, thereby saving the expense of dog trains from Good Hope to Norman. The evening of August 12 we experienced a sharp frost.

On August 15 we passed Norman, where we cached supplies for our return. Good Hope, the most northerly point of our trip, was reached on August 18 after a week's travelling, the distance from Wrigley being close to three hundred and forty miles. During our whole trip down the Mackenzie, we encountered no obstacle to navigation. There are two rapids between Norman and Good Hope: the first one is the Sans Sault, which is run by following the current of Careajou river that comes in from the west just at the head of the rapid. The other is Rampart rapid, which is easily run by keeping close to the right bank of the river, so close in fact that one could almost jump from the scow to the mainland. As this latter rapid is approached, high perpendicular sandstone cliffs apparently hem the river in on all sides. However, upon rounding a bend or two, walled with these towering cliffs, Good Hope appears high up on the hillside, its whitewashed buildings gleaming brightly in the sunlight.

Even at this settlement, on the verge of the Arctic circle, we found thriving gardens in which potatoes, onions, lettuce, rhubarb, turnips and carrots were growing. No farming has ever been attempted so we laid out lots of sufficient size to meet the requirements of the settlers. We also surveyed a lot containing one hundred and twenty-one acres to meet the demands of the Indians, of whom there are about six hundred trading at this post. The work we have done there will be sufficient for many years.

While we were there an Indian brought in a piece of native copper that he picked up on Lean river which flows into the Mackenzie twenty-five miles north of Good Hope.

We had a snow-storm on August 31 and also experienced considerable wet weather in the first two weeks of September.

Throughout the north moose, caribou, and bear are plentiful but it is necessary to go back some distance from the river to hunt. Mountain sheep and goats roam the mountain slopes, while ducks, geese, ptarmigan and partridges can be obtained with but little effort during the summer season. Fish of course are to be had in abundance if one carries a net of three and a half inches mesh.

We left Good Hope on September 18 and tracked our two canoes up the river to Norman where we arrived on September 30. This settlement is situated at the mouth of Great Bear river. There, as at all the settlements we visited, the only white people we found were the representatives of the two missions and the clerks of the Hudson's Bay and Northern Trading companies. These usually comprise about five per cent of the squatted population.

The only grain grown there to my knowledge is barley, the summer season being too short for wheat and oats to mature. The white people have small gardens, and the Indians depend for their livelihood on trapping, hunting and fishing. We laid out twenty-six small lots and a larger one to serve as a reserve for the Indians.

The country between Norman and Great Bear lake is largely muskeg which extends close to the settlement, Norman itself being located on a fringe of dry land between the edges of this muskeg and the banks of Great Bear and Mackenzie rivers.

Great Bear lake is open during the latter part of July, August, September and October of each year. Its waters are alive with magnificent lake-trout, whitefish and herring, besides other less valuable species. Countless number of caribou roam the "barren lands" which surround the lake, and the Indians still hunt them down with bow and arrow.

There are deposits of native copper in the vicinity of this lake, at Dismal lakes and on Coppermine river. Mr. John Hornby, an English explorer, who has spent the past seven years on the barren lands, gave me a sample of this copper which he picked up on Coppermine river.



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Great Bear river can be ascended in July and freezes over about November 10, but on account of drift ice canoes are useless after the third week in October.

About twenty-five miles up-stream from Norman on the left bank of the river, there are deposits of lignite of good quality. There is also another seam a short distance above this post which is on fire and has been smouldering away for many years. We also heard that a short distance down-stream from Norman crude oil could be seen oozing out of the ground at low water but as we did not pass it at the right time of the year, we were not able to observe this ourselves.

Mackenzie river was frozen over completely by November 18 and on November 25 we left Norman with three dog trains for Wrigley. On account of the strong current between Norman and Wrigley it is the last portion of the river to freeze over and the drift ice from above comes down and piles up, forming a terribly rough and jagged surface for dog teams to travel upon. In fact we had to cut many miles of trail for the sleds through this rough ice, and upon several occasions we ran into ice walls four feet thick and fully eight feet in height. Our progress was necessarily slow, but we at last reached Wrigley on December 4. By the latter part of December the snow covers up most of these rough parts and the journey can be made in six days, which is the usual time taken by dog trains between posts.

We waited at Wrigley till December 9, when the dog trains arrived from Simpson as had been previously arranged. After one day's rest, these trains carried us to Simpson, where we arrived December 16, in time to catch the outgoing mail to Athabaska, which left December 17.

In this north country the winters are long and during January and February the cold is intense. On one occasion the thermometer registered 58 degrees below zero, Fahrenheit, and frequently during the day it was 40 degrees below. The Indian agent utilizes the winter months for logging purposes and he is provided with two teams of work oxen. Hay for their use is obtained up Liard river a short distance from the post. I understand it is not so long since the Hudson's Bay company had a fairly large herd of cattle at this post which was at that time the headquarters of the company for the Mackenzie River district. North of Simpson there is a very small quantity of timber fit for lumbering purposes but to the south and up Liard river there are large areas covered with timber of commercial value. The Royal Northwest Mounted Police, who now have a detachment established there, are aiding the fire patrols and, comparing the summer of 1914 with that of 1913, we noticed a very large decrease in forest fires.

During the latter part of February and beginning of March we traversed a portion of Liard river and laid out a reserve for the Indians about Simpson. This was done at the request of Mr. Harris, the Indian agent.

It is difficult to obtain dog trains during the months of January and February, as the Hudson's Bay company have their trains carrying mail and making inspection trips between posts while the Indians are away on their hunting expeditions.

Early in March I sent my assistant and three men ahead to Hay river, and after the March mail came into Simpson, followed them as far as Providence. By dividing the party we were able to utilize the time from May till the third week in June, when, on account of the spring break-up, it is impossible to travel on the Mackenzie. We occupied this time in surveying and mounding the two settlements.

The land at Providence is fairly good and we accordingly laid out a few large lots in case any person should care to farm the land. Oats and barley are grown successfully here, but Father Giroux, in charge of the Roman Catholic mission, says that wheat seldom gets beyond the milk stage. We also laid out a large lot which will serve as a reserve for the Indians who visit the post. The Roman Catholic mission has a convent there and are educating the Indian boys and girls from all parts of the country to the north. They have also a small herd of cattle. Hay is found in abundance in the vicinity of the fort, and is of good quality as was testified to by the



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excellent condition in which we found the cattle after the long tedious winter. The remainder of the lots were laid out as garden plots and sufficient were surveyed to last for some years.

At Hay river two large lots were laid out, one for the Anglican mission and the other for the Indians. The other lots were laid out to take in the claims of the various settlers and each settler was given land according to his requirements. We laid out thirty-two lots in all which I think will be sufficient for at least ten years.

The land bordering on Hay river and on Great Slave lake consists of a fertile sandy loam and the gardens produce splendid vegetables. Wheat and oats have been successfully grown. Settlers have been able to seed the land as early as the first week in May, and on account of the long summer days plant growth is very rapid.

The climate throughout the north during the summer is ideal and not liable to sudden change. It becomes very warm during July and August. There is just enough rainfall to keep the ground in excellent condition for grain or vegetable growing. The wet season seems to extend from the latter part of August to the middle of September and frosts are then of frequent occurrence.

Fifty miles up Hay river from the settlement the Alexandra falls are to be found. The main fall is one hundred and six feet in height, and the lower fall forty-six feet. At the main fall the river runs between limestone cliffs, and power can be easily developed when necessary. There is a lot of good land bordering on Hay river, and it becomes better as one journeys up the river. Just above the main fall there is a fine park-like country to be seen.

We left Hay river June 30, 1914, and crossed Great Slave lake by canoe to Resolution, arriving there at midnight on July 2. We completed the survey of this settlement on July 28, and next day caught the steamer *Mackenzie River* for Fort Smith where we arrived on the 31st.

At Fort Smith we learned that engineers had been busy running location lines for a tramway between Fort Smith and Smith Landing so that in the near future there will evidently be a quicker and cheaper method of transportation than there is at present. I understand that most of the surveyed portion of Smith Landing and Fort Smith has been taken up so that there will be additional survey work required around these places in a short time.

We left Smith Landing on August 4, on board the steamer *Grahame* and arrived at McMurray on the 9th. We then hired two pack-horses and took the overland trail to House river arriving there August 14. We passed through some fine ranching country portions of which were suitable for farming, especially as we approached House river where we found subdividers at work.

We then loaded our outfit on board the gasoline launch which plies twice a week between Athabaska and House river and reached Pelican settlement at dark on August 15. We there subdivided the front portions of lots 8 and 9 into village lots, which work completed our operations.



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## APPENDIX No. 29.

## ABSTRACT OF THE REPORT OF J. A. FLETCHER, D.L.S.

## BASE LINE SURVEYS IN NORTHERN ALBERTA.

On April 8 I left Edmonton and travelled by rail to Sawridge, and thence by winter trail to Peace River Crossing where I arrived on April 20, 1914.

The outfit and supplies were loaded on scows which had been constructed for us, and the trip down Peace river was begun on April 26. At Carcajou point, which we reached on the 28th, enough supplies to last the party about two months were cached. The remainder was sent down to Fort Vermilion. The pack train which had been wintered west of Fort Vermilion met us at Carcajou point and we immediately moved to the starting point of our work in range 17.

The survey of the 26th base was commenced on May 1 and continued easterly without interruption till we reached range 9 on June 22. As the supplies were by this time running short this part of the work was discontinued for the time being, and the party and outfit moved north to the 27th base.

Arrangements had been previously made to have the supplies which had been sent to Fort Vermilion taken up Wabiskaw river as far as possible. Owing to the low water the highest point reached was about six miles north of the 27th base line. A cache was built at this point.

The survey of the 27th base was commenced in range 9 on June 25. Immediately after leaving the Wabiskaw very swampy country was encountered over which it was impossible to use pack-horses. Consequently the pack-trail was run east from the cache which had been built on the Wabiskaw as far as Mikkwa river, where access to the line was again possible by pack-train. At this time twenty-one pack outfits were burned, and until they had been replaced from Fort Vermilion, the survey proceeded somewhat slowly. The line was completed to the Fifth meridian on August 24, and on the 25th the return trip to the 26th base was commenced.

Work was resumed on this base on September 3 and continued without interruption till the meridian was reached on November 2. The north boundary of fractional range 25, west of the Fourth meridian was then surveyed, and the mounding entirely completed on November 4.

Our trail out, was by way of the Burnt lakes, Chipewyan lake and Wabiskaw to Sawridge, where we arrived on November 30. From there we took the train to Edmonton where the party was paid off.

The weather during the season was delightful, the warm period experienced at the commencement of the survey continuing without interruption till its completion. Considerable rain fell during the year, and on account of the moisture combined with the warmth, the spring growth was early and rapid. The daily growth of grass on the western slope of Buffalo Head hills was quite marked during the second week in May, and by the middle of May the grass in range 15 was a foot high. The horses were fed in this range till the camp was moved out of reach, and no more grass even of average quality or quantity was found till the survey reached Wadlin lake. Some good grass was found on the east end of this lake in range 10. However, the good feeding of range 15 and the absence of flies in quantity at that time, put the horses in good enough condition to carry them across the succeeding interval of coarse and scanty feed. There are some excellent meadows along Wabiskaw river especially from township 102 north. Horse feed along the 27th base line was excellent. Numerous creeks along which were old beaver workings provided rich bottoms for luxuriant grass and peavine. In spite of the fact that the flies were exceptionally bad during the months of July



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and August, the horses gained sufficiently, so that the majority came through the succeeding months of poor feed and heavy work successfully.

On the return of the party to the 26th base in September, the frosts soon reduced the quality of the grass, which was not in quantity to render foraging easy. In October it was all frozen and dry, and an interval was crossed in ranges 4 and 3 where there was no feed. The trail at this time was difficult, and the older horses fell off badly. Three of these died on the trip out, but as there was good feed along the trail all the way to Sawridge, and as oats and hay were available in places, twenty horses survived.

During the season, three canoe trips were made down the Wabiskaw to Fort Vermilion for oats, extra supplies and mail. This work relieved the strain on the pack-train, rendering the completion of the survey possible before the beginning of winter. Two men were required to manage the canoe.

In high water canoes could be successfully used on Mikkwa river, but in low water the numerous rapids make travel very difficult.

The country on the 27th base is quite level, the interval between Wabiskaw and Mikkwa rivers, and also the territory for about ten miles east of the Mikkwa being subject to very little drainage. The ridges are merely slight elevations on which the growth of poplar and spruce is possible on account of the ground being heated, in the absence of standing water. They are therefore ridges of timber rather than rises in the ground. With the exception of some large scattered spruce growing along Mikkwa river, very little timber of milling size was seen on this line. The district I believe would be suitable for agriculture, but on account of the swampy nature of the ground and the difficulties of transportation, there is at present very little inducement for settlement. Ranges 1 to 5 are not so swampy as ranges 6 to 9, but are more difficult of access.

On the 26th base line, ranges 16 and 17 lie at the base of the western slope of the Buffalo Head hills. There is sufficient slope for the country to be well drained by numerous creeks. These ranges would make good agricultural land as would also parts of range 15, where the country is more rolling. Windfall and *brulé* at present cover most of this country. From range 14 to Wabiskaw river, the country is more or less rolling with intervals of muskeg. The soil of the rolling country is mostly light as is indicated by the extensive growth of scrubby jackpine. Wadlin lake is crossed in ranges 11 and 10.

Range 9 is quite broken by Wabiskaw river, which curves around the eastern limit of the Buffalo Head hills. A small creek which drains Wadlin lake crosses the 26th base in a deep rock-bottom ravine and flows into the Wabiskaw just south of the base line. On account of having a fall of approximately 1,300 feet in a distance of about six miles this stream resembles a mountain torrent in places and considerable water-power could be developed, due more to the head of the water, however, than to the volume of discharge. In the neighbourhood of the Wabiskaw there is considerable timber of milling size both east and west of the river. Farther east along Mikkwa river and again on Burnt river some large spruce is to be found. This could be easily carried to Peace river during high water.

From the Wabiskaw eastward to the Fifth meridian the country is quite flat or gently undulating. Mikkwa river flows in a valley from a quarter to half a mile wide and from fifty to eighty feet lower than the surrounding country. The country back from the valley appears capable of being drained and afterwards would make good agricultural land. However the drainage problem is a large one and for this reason settlement will likely be slow.

Moose seem plentiful in this district especially over the Buffalo Head hills. Bears are numerous along Wabiskaw and Mikkwa rivers. Fur-bearing animals are numerous, consisting of beaver, foxes, martin, wolves, lynx, rats, etc.



## APPENDIX No. 30.

## ABSTRACT OF THE REPORT OF W. A. FLETCHER, D.L.S.

## STADIA SURVEYS IN CENTRAL SASKATCHEWAN.

The district from Swan River to Yorkton, through which we travelled to reach our work, for the most part is settled by Dukhobors and Galicians, with some Russians and Austrians. The majority of the Dukhobors live under the community system, where all profits and products are turned into one general coffer, whence each in turn receives his allotted supply. Quite a large percentage, however, live independent of the communities on their own homesteads.

This section is largely covered with a thick growth of poplar from four to six inches in diameter, and has innumerable sloughs and ponds of all sizes. As the settlement is recent most of the road allowances are impassable, and good or even passable trails continuing more than five miles in any direction are hard to find.

Our work consisted in the investigation of water areas in the vicinity of townships 25 to 27, ranges 11 to 14, west of the Second meridian. Most of the townships in this district are well settled, and a fair percentage of the land is under cultivation. Most of the land is rolling with scattered bluffs of poplar. Small lakes are quite numerous.

Speaking generally of the whole district, the settlers are rapidly turning towards mixed farming. More hay, oats and barley are being grown each year instead of wheat. Dairying is also becoming an important industry, many large herds of milking cattle being observed.

Owing to an unusually dry summer the grain crop was only about forty per cent of the average of more favourable years. The potato crop, owing to drought and a heavy frost early in August, was almost a complete failure.

I closed operations and disbanded the party on October 17.



## APPENDIX No. 31.

## . ABSTRACT-OF THE REPORT OF L. E. FONTAINE, D.L.S.

## INSPECTION OF CONTRACTS IN NORTHERN ALBERTA.

I organized my party at Edmonton and from there proceeded to Whitecourt, in tp. 59-12-5, where I arrived on September 27, 1914. Contract No. 18 of 1913, which I completed inspecting, lies in the immediate vicinity.

We then returned to Edmonton, and on October 7 left for Spirit River. There I mapped out the work for the first part of the season consisting of the inspection of four survey contracts, one in Grande Prairie district and three near Peace River Crossing. This kept the party busy until February 16, 1915.

The weather during the survey was fine. The fall was dry and the winter mild with a very light snowfall.

The routes followed were the main ones of the respective districts. The Edmonton, Dunvegan and British Columbia railway runs mixed trains to McLennan on Round lake, and steel is laid to within twenty miles of Peace River crossing. When this road is completed a twenty-four hours' journey will take one from Edmonton to the Crossing, whereas in the past it has taken about twenty days.

We returned to Edmonton on February 25, and on March 1, I left for McMurray to inspect four contracts in that vicinity. At this place the work was carried on with sleighs till the spring break-up and then by pack-trains and canoes.

The McMurray district has not shown as much development as the Peace River, although it has natural gas, tar sands and water-powers. Telegraphic communication has been established between Edmonton and McMurray and the contractors of the Alberta and Great Waterways railway expect to have the two places connected by rail in February, 1916. This will prove a great impetus to the development of the district. About one hundred tons of asphalt from deposits near McMurray have been shipped to Edmonton, where it is being given a trial on road making.

I closed operations for the season on June 4, 1915.





Photo by F. V. SEIBERT, D.L.S.

#### RE-LOADING AT FOOT OF CASCADE RAPID—ATHABASKA RIVER.

This shows the method of handling supplies where the distance is not great. Each article is passed along a chain of men from one to the other until it reaches the scow where it is stored away by three or four extra men. In this way six ton of supplies were unloaded, the scow run over the cascade, and re-loaded in forty-five minutes.



Photo by F. V. SEIBERT, D.L.S.

#### LOADING HORSES ON SCOWS AT McMURRAY—ATHABASKA RIVER.

The horses are taken overland from Athabaska to this place, as the rapids on the river between these two points make transport of horses by scows risky. Below McMurray there are no rapids and no trails, which render transport of horses by scow both possible and necessary. From eight to twelve horses and three to four ton of supplies are placed on each scow. The horses are unloaded every night and re-loaded in the morning owing to the cold nights. These horses travelled 110 miles in this way without accident.







## APPENDIX No. 32.

## ABSTRACT OF THE REPORT OF J. S. GALLETLY, D.L.S.

## SUBDIVISION IN NORTHERN MANITOBA.

My work consisted of subdivision surveys along the Hudson Bay railway from the vicinity of Pas, north to tp. 64-14-Pr.

We left Pas on July 9, 1914, and travelled by construction train to mile 93, which was in the vicinity of the most northerly part of our work.

For transport outfit we used a small velocipede and a standard push car, and to this I later added a hand car, as I found we could save considerable time going to and from work by its use.

We continued surveying in ranges 14, 15 and 16 until September. We then returned to Pas to make some surveys in townships 56, ranges 26 and 27, west of the Principal meridian. This kept us busy till November 6, when we began working north again along the railway. We brought our work to a close in the vicinity of tp. 62-18-Pr. in the early part of March and returned to Pas, where the party was disbanded.

The country surveyed along the Hudson Bay railway between ranges 14 and 19 is mostly level, or very gently rolling. It is generally of a swampy nature, and one might well describe it as a succession of spruce and tamarack swamps, alternating with ridges of limestone on which there is always a growth of jackpine with some poplar.

In several places we dug to a depth of about six feet to get drinking water, and it was usually found that at a depth of about two feet there was a very good clay soil. On top of this clay there is a thick growth of moss which holds the water like a sponge, and which would have to be removed before anything could be done in the way of farming operations. It could be cut, dried and stacked and would make peat of good quality, and if this were done the clay loam left would, if properly drained, form a first-class soil suitable for mixed farming and grain growing. In range 14, I noticed one or two ditches put in by the railway constructors from the track to Mitishto river, and the effect was very noticeable, this being one of the driest parts of the district surveyed, yet I was told that this had been one of the worst swamps that the railway had to cross.

There are a few spots where the clay comes close to the surface, and on one of these I found a trapper with a small garden in which he was successfully raising potatoes, carrots, turnips, cabbage, lettuce and radishes, and there appears to be no reason why the same could not be done elsewhere, if proper drainage were provided.

I also saw oats and barley growing along the track, the seed evidently having been dropped from cars in transit.

Though swampy, none of the land is liable to flood through the overflowing of rivers. There is no hay in this part of the district.

The timber consists of spruce, tamarack, jackpine and poplar, and seldom exceeds a foot in diameter. The reason of this is that the moss in the swamps is not strong enough to hold large trees in a high wind, and on the limestone there is not usually sufficient soil to give large roots a firm hold. There is plenty of small timber in the country; in fact there is no open country in the usual sense of the term.



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Mitishto river is the only stream of any size in this district; it is a little over a chain wide and about three feet deep, but the current is very slow, seldom exceeding a mile an hour. It lies in a slight depression which can hardly be called a valley, and in only one place, on the east boundary of tp. 64-14-Pr., were the banks steep. Elsewhere the slope is so gradual as to be unnoticeable. It flows from the east end of Limestone lake, crosses the track close to the lake and is never far from the railway as far as our survey went. Many of the swamps along the railway could be drained into it. No water-power could be developed.

No coal or lignite was found, nor was there any mineral of economic value seen within the limits of the survey. The new gold field, at Herb lake, is not very far away, however, and is reached by a sleigh trail, cut after the survey was made, which leaves from the siding at Woody lake in tp. 64-15-Pr. about eighty miles from Pas. Prospectors state that the claims are very good, and that the district will develop into a good mining camp.

There is no stone suitable for building, but limestone is everywhere plentiful. It is probable that a considerable part of this could be used in the manufacture of lime.

Summer frosts occur, but these would not be sufficient to hinder any farming operations which might take place.

Two large lakes were seen in this part of our work, Woody lake in tp. 64-15-Pr., and Limestone lake in tp. 62-18-Pr. The former is from twelve to fifteen miles long and six miles wide; it lies in a southwesterly direction, the northeasterly extremity being in tp. 64-15-Pr. Its shores, as far as we saw them, are sandy or rocky. It empties into Woody river, which is twenty feet wide and six feet deep, and has a current of about six miles per hour. I was informed that it runs in an easterly direction and then southerly flowing into Pine river. Limestone lake lies wholly in tp. 62-18-Pr.; it is five and a half miles long and half a mile wide. A trail runs from the southwest corner of this lake to Moose lake, about eight miles distant in a southerly direction, but as fires have caused a large part of it to be filled with deadfall, it is not at present suitable for use. Both Limestone and Woody lakes are deep and the water in them is good and clear.

There is a spring of excellent water at mile 78 on the Hudson Bay railway in tp. 63-16-Pr., close to the track. We found it running in March, and it is apparently open all winter. It is by far the best water we obtained in this district.

Game is scarce, and with the exception of a moose, some caribou, and a few partridges, we saw nothing. Fish can be obtained in Woody and Limestone lakes, but both have been pretty well fished out, and it will take some time for a fresh supply to accumulate. Jackfish, whitefish, lake trout and sucker are the chief varieties obtainable. Several men were at work fishing in Moose lake last winter, and they stated that the supply was good. When a lake shows signs of depletion the fisheries inspector either refuses to permit fishing in that lake or limits the catch to a certain amount. This method should preserve the supply indefinitely.

In township 56, range 27 lie parts of Saskeram and Reader lakes. Both of these lakes are very shallow and have muddy bottoms. Three rivers, Saskatchewan, Carrot and Birch, run through the township, all three being navigable rivers while the last mentioned drains Saskeram lake. The east boundary of the township is only three miles from Pas.

Between the Saskatchewan and the Carrot there are numerous hay meadows and some swamps. The hay, a blue-joint of fine quality, is growing on a deposit of clay brought down by the rivers and left during the periods of flood. A conservative estimate of the amount of hay which can be cut in this township alone would be in the neighbourhood of four thousand tons, and this could be increased by draining some of the swamps.



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The meadow extends beyond this township into the adjacent ones, between Saskeram lake and Saskatchewan and Carrot rivers, and it would provide an immense amount of hay and make a good place for ranching. The only objection to putting it to such a purpose is the liability of the whole of it to flood. As I understand it, this is not likely to occur at high water in July, but just after the break up in the spring, and it is caused by the ice jamming in the Saskatchewan at Grand Rapids some distance below Pas.

As the soil is first class, it makes it a very desirable locality for mixed farming and grain growing. The former is badly needed in this vicinity, as Pas with a population of fifteen hundred is using condensed milk almost entirely and vegetables are at excessive prices.

I found seven settlers who had gone in along the banks of Carrot river to homestead, and four of them told me they had cut six hundred tons of hay from their four fractional quarter sections, and they had not by any means stripped the quarters of what hay was on them. These men know of the liability to flood, but they believe that it will not happen again, as the volume of water in the river seems to be lessening each year. In the fall ducks are very plentiful in Saskeram lake and the neighbouring marshes, and there are some geese to be had also.



## APPENDIX No. 33.

## ABSTRACT OF THE REPORT OF JAMES GIBBON, D.L.S.

## SURVEYS IN THE VALLEY DISTRICT OF THE RAILWAY BELT, BRITISH COLUMBIA.

Survey operations of the past season were commenced on May 6, 1914, in tp. 5-26-6, in the valley of Coquihalla river. I followed this river as far as the northern part of township 23 in range 7, subdividing all suitable lands. An independent and continuous traverse was also run along both banks of the river from its intersection with the east boundary of sec. 7, tp. 5-25-6, to its intersection with the outline between ranges 24 and 25 in township 6. From this latter point a single traverse line was run for both banks, to the intersection of the east boundary of sec. 33, tp. 7-23-6. These traverses made an independent check on all section corners and lines established.

My surveys in the Coquihalla valley had reached within a couple of miles of the steel on the new Kettle Valley railway, and as the back trail was both dangerous and difficult on account of canyons and heavy blasting on railway construction, I got transportation over this railway to Merritt, and thence to Hope by Canadian Pacific railway. I commenced the surveys required in township 5, range 26, on October 21.

On completing this survey, I closed field operations for the season, and on October 31 paid off my party. The lower parts of Coquihalla valley can be conveniently reached from Hope by wagon and pack-trail. The upper reaches can be more easily reached by the Kettle Valley railway construction train from Merritt.

The greater part of Coquihalla valley is heavily timbered with large fir, cedar and hemlock, reaching well up on the mountain slopes, with dense undergrowth in the lower elevations. This meant heavy continuous axe-work all season in the projection of our lines. The valley is comparatively narrow with precipitous mountain sides of about 4,000 feet elevation.

Anderson, Pierre and Dewdney creeks are tributaries from the east. Their valleys are narrow and confined with steep slopes starting from the water's edge and leaving no bottom or agricultural lands. There is considerable fir and cedar in these valleys, but it will be difficult to get out, owing to the rough nature of the creeks and the confined valleys. Timber berth location No. 458 is on Dewdney creek two or three miles from its mouth.

Ladner creek comes in from the west, joining Coquihalla river in sec. 24, tp. 6-25-6. There is considerable fir and cedar timber throughout its valley and on the adjacent mountain slopes, and also on the south side of the creek, extending back from Coquihalla river some two or three miles. This is a more promising section for timber than the other tributaries, but part of timber berth No. 177 extends into this region of timber and of course occupies the most accessible portions. This valley presents no agricultural possibilities.

These creeks are from seventy-five to one hundred links wide and from two to three feet deep under ordinary conditions, and have a current of six to eight miles per hour.

From Ladner creek up through ranges 24 and 23, the river narrows to about one chain in width, and decreases correspondingly in volume. On reaching township 7, range 23, there is a sudden rise of some fifty feet, and the river bottom widens out into a natural dam location. Some water-power could be developed at this point, but the supply of water would be rather uncertain, owing to the elevation and the nearness



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to summit, causing the supply to come nearly all from flood conditions. It might, however, be practicable to use it as a means of converting the timber above it into lumber.

There are some indications of minerals in the lower stretches of the valley. Several miners were operating in a small way all summer, prospecting and washing out placer gold from the gravel bars of the river. They reported better than wages as the result. Some rich prospects in gold-bearing quartz are reported as being found and opened up on the western slope in township 6, range 25; as high as nine hundred dollars to the ton is reported. Staking of claims has been active all along the hill-sides.

Very little game was seen other than a few mountain goat and indications of black bears and deer. The river contains numerous small trout, but is kept pretty well fished out by the large number of men working on railroad construction.

No doubt in the near future when the new railway is in operation throughout the valley, the natural resources in timber and minerals will be developed, and the favourable spots for cultivation will be taken up. There is a splendid opportunity for the erection of a portable mill or mills at favourable points for manufacturing and shipping lumber, ties and wood, and thus utilizing and conserving much valuable timber that usually goes to waste in general lumber operations.

The season was very favourable for field operations, with very little rain, no excessive heat and few flies.



## APPENDIX No. 34.

## ABSTRACT OF THE REPORT OF T. D. GREEN, D.L.S.

## SUBDIVISION IN SOUTHWESTERN ALBERTA.

My work during the past season consisted of subdivision surveys west of Red Deer in tps. 35 and 36-8-5 and tp. 40-10-5.

We outfitted at Rocky Mountain House and left for tp. 35-8-5, reaching there on June 12, 1915.

Two routes lead from Rocky Mountain House, the nearest railway station to our work. The first and old route crosses the upper bridge over Clearwater river, passing Dovercourt post-office and thence to Ricinus in tp. 36-7-5. Up to this latter point the country is well settled and the roads are generally in fair condition, but beyond that the wagon roads are newly cut out by survey parties, and after reaching range 8, practically make a circuit around the central portions of townships 35 and 36. An old pack-trail follows the northwesterly or left bank of the Clearwater through these townships, and continues up stream probably to the source and beyond, to join the pack-trail from Laggan to the Kootenay plains. There are several different branches running north towards the Saskatchewan. One of these, which forms the second route to the district, leaves the pack-trail in range 9, and goes northerly to Swan lake, thence northeasterly along Swan creek, passing through the northwesterly portion of tp. 36-8-5. The Forestry Branch has recently improved this trail to such an extent that wagons can now travel thereon from Prairie creek to the Clearwater. It joins the Prairie creek-Rocky Mountain House trail near the mouth of Swan creek. The latter is a wagon trail leading to Rocky Mountain House by either the upper or lower bridges over the Clearwater. The route by the upper bridge is much better though longer.

Township 40, range 10, can now be reached by railway, as Horburg a station on the Brazeau branch of the Canadian Northern railway is situated in section 6, tp. 40-9-5. In addition to this the Northern Construction company's "tote" road from Rocky Mountain House leads to the southern part of the township and a branch therefrom leads through the northeastern part along the south branch of Baptiste river.

In these upper reaches of Clearwater, Saskatchewan and Baptiste rivers moose and deer are quite plentiful, and rabbits are so numerous as to be a nuisance. Fish also are very plentiful. Ordinarily there is not enough snow for sleighing before the latter part of December, but last fall there was sufficient snowfall early in November for permanent sleighing. The ordinary depth of snow in the winter is about fifteen inches.

Owing to the high altitude and the existence of large muskegs and marshes summer frosts are prevalent in the district.

The river valleys are excellent for cattle ranching.



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## APPENDIX No. 35.

## ABSTRACT OF THE REPORT OF A. H. HAWKINS, D.L.S.

## MERIDIAN AND BASE LINE SURVEY IN NORTHERN MANITOBA.

On March 5, 1914, I left Pas, the place of organization and proceeded to Thicket portage, travelling ninety miles by Hudson Bay railway and thence by freight teams for one hundred miles along the right of way.

Our first work of the season was the survey of the Principal meridian through townships 81 to 88. Owing to the late spring it was possible to place a considerable amount of supplies on the north boundary of township 82, about twelve miles beyond the starting point of our survey. From Thicket portage the outfit was moved by dogs teams along a fairly good sleigh road, to Partridge Crop lake, but from there north to Odei river in township 82 progress was slow, on account of soft weather, deep snow and lack of trails. From Odei river man-packing was resorted to for a distance of about twelve miles, to the northeast corner of township 83.

The rivers broke up about May 10 and as all our canoes were at Thicket portage in township 73, we had to construct rafts to cross Odei and Meridian rivers. The men with the canoes arrived on June 10, having travelled via Wintering and Partridge Crop lakes, Grass river, Split lake and Burntwood, Odei and Meridian rivers. Later we found a much shorter route on the west side of the meridian from Thicket portage to Burntwood river, and thence down that river. Meridian river which had apparently never been used as a canoe route was full of log jams. We cleared these out, and now a waterway extends from Thicket portage to township 86. No farther waterway exists, as this appears to be the divide between the Churchill and the Nelson.

Odei river which is about two chains wide and from six to sixteen feet deep, with a current of two to three miles per hour, crosses the Principal meridian in township 82. A half mile farther east it is joined by Meridian river which crosses the meridian once in township 85, once in township 84 and three times in township 83. The source of Meridian river is Big Fish lake in township 86. From this lake short portages can be made to navigable waters flowing north into Churchill river.

The country crossed by the line is all clay formation, and judging from the banks of the streams the clay is of considerable depth. A granite ledge on the summit of a ridge in township 84 was the only rock seen south of Big Fish lake. The clay belt apparently extends from Burntwood river to township 89. The surface in the southern part of this belt is gently rolling, and muskegs, sloughs and floating bogs are numerous. The surface soil in the depressions is peat with clay subsoil, while on the higher lands the clay appears on the surface. Forest fires are prevalent, as during the summer the dry moss burns like tinder.

The northern part of the clay belt is gently rolling and covered with spruce and tamarack up to ten inches, with some poplar and birch up to six inches. A few large spruce grow alongside the rivers, but the timber generally is suitable only for pulp.

Swamps, marshes and muskegs abound throughout the whole region, and thorough drainage is necessary before settlement could be attempted. The many streams would render drainage comparatively easy, and danger from early and late frosts would no doubt be greatly lessened.



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No grass grows in the district, but gardening at Norway House and Split lake has been carried on with considerable success.

The district is easily reached by water from many points on the Hudson Bay railway, but the waterways are difficult to follow.

Water-power could be developed on Grass, Nelson and Burntwood rivers. A fall of about twenty feet was also seen on Meridian river in township 82, the portage around it being about five chains.

No coal, lignite nor minerals were noticed in this district.

A few foxes, wolves, bears, mink, otter and martin were seen, and moose appeared to be plentiful. Beaten paths indicated that the barren lands caribou had wintered there, but they had gone north before our arrival.

Frost occurs every month of the year except perhaps July. At the beginning of May, 1914, there was two feet of snow which did not entirely disappear before the middle of June, and frosty nights began on August 20.

Levels were taken on the line to township 88, and magnetic observations were made at frequent intervals. Some azimuth observations and one observation for latitude, consisting of seventy pairs of stars, were destroyed by a camp fire on July 1. This fire also destroyed some of our supplies, so that after surveying the 22nd base line one range east and west of the meridian, we returned to Pas reaching there on September 19.

I then organized a party for the retracement of the Second meridian from the 15th base as far north as township 85, and of the 15th base westerly from the meridian to range 22.

We left Pas on October 10 and on the 26th began work on the meridian at Namew lake. This place was selected as a starting-point, as the line farther south was reported to be very wet.

Moving camp had to be done by canoes and man-packing, the dog trains being left at Namew lake till cold weather would set in. Comparatively mild weather prevailed until the middle of November so that the dog trains did not arrive until the 20th.

Directly north from Namew lake dry, rocky country, well timbered with black spruce, tamarack and jackpine, extends about six miles north and three miles on each side of the meridian, but farther north the country is mostly muskeg.

The wagon road follows the east side of the meridian to within a half mile of Sturgeon-weir river where it crosses the meridian and leads to a place called Beaver City, on the south shore of Amisk lake. If the mining locations around this district prove valuable this centre will be of some importance, as great opportunities exist for the development of water-power, and fish and game can be had in abundance.

In the north part of township 62 there is an extensive spruce muskeg with a hard bottom about fourteen inches below the surface. Timber, which grows larger toward the north, is found on small ridges throughout the muskeg.

The limestone formation which was in evidence all along the line from Namew lake disappears in township 64 and a granite formation begins. Mineral indications are found along this line of contact.

On November 20 the dog trains reached camp and the lakes being frozen sufficiently for travel they were used for moving camp and taking in supplies. The seven trains proved inadequate as we had to move camp every second day.

In township 68 the line crosses the first of the chain of large lakes which form an almost continuous waterway to township 85. Whitefish, jackfish, pickerel and sucker appeared to be plentiful in these waters and form the chief diet of the Indians living there. Feed for the dogs consisted of fish caught in these lakes, and it was necessary to keep one man fishing and looking after the nets while we were in this locality.

The southern fringe of the herds of barren land caribou were seen in township 84, but the main herds were farther north as the winter was mild.



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The Second meridian was finished to township 85 on January 10, 1915, and the portion of the line south of Namew lake, which was too wet to retrace in October, was finished by the end of January. In this portion only township 58 is wholly on land. The main trail from Pas to Cumberland House passes the north end of Belanger lake in township 57. Much traffic passes over this trail in winter as all supplies from Pas for settlements west and north pass over it. Large quantities of fish shipped to Pas also go over this trail.

Steamers on Saskatchewan river can pass into Cumberland lake during high water, and from there through Whitey and English Narrows into Namew lake. Amisk lake is then reached by a short portage from Namew lake. Amisk lake is about thirty miles long and sixteen to twenty miles wide. Its shores are well wooded, and much work has been done developing mining claims along the west side. The fishing industry is also important, as during last winter considerably over one hundred tons of trout and whitefish were shipped from this lake. Churchill river, which crosses the line in township 79, appears to consist of a series of lakes stretching across the country. The shores are rocky and frequent rocky rapids render navigation dangerous.

Several lakes lie along the meridian north of township 85, the largest being Kamuchawi lake in township 83. This lake is about twelve miles wide and fifteen miles long.

Only a small amount of tillable land is found in this district, and it is all covered by forests. Garden vegetables grow at Cumberland House and I am told also at Amisk lake. Fishing and mining are likely to prove the most important industries.

The retracement of the 15th base west of the Second meridian was begun on February 1, 1915. This line follows along Saskatchewan river, crossing it three times in the first eight ranges. If the spring freshets on the Saskatchewan could be controlled and this land reclaimed from flooding, hay for many thousands of cattle and horses could be secured.

The valley of Torch river, which is first crossed in range 8, is well wooded with spruce, tamarack, poplar and cottonwood up to twenty inches. Some good farms are found in the valley, but the remainder of the country is one vast muskeg, with a few sandy jackpine ridges.

In range 17 the line crosses sand hills, some of which are bare on the tops, while the slopes are covered with spruce, tamarack, poplar and white birch. An old surveyed line of the Hudson Bay Pacific railway was crossed in range 18.

The line was completed across range 21 on March 10 and Cumberland House was reached on the 17th.

The mild winter and light snowfall made the trails bare very early in spring and travelling with sleds was difficult.

Very little merchantable timber was seen except along Torch and Saskatchewan rivers. No hay meadows or marshes were noticed farther north than Saskatchewan river, muskeg and sand ridges being the predominating features of that district.



## APPENDIX No. 36.

## ABSTRACT OF THE REPORT OF G. H. HERRIOT, D.L.S.

## BASE LINE SURVEYS IN NORTHERN MANITOBA.

The survey of portions of the 19th, 21st and 22nd base lines east of the Principal meridian, portions of the 23rd and 24th base lines east of the Second meridian east and the Second meridian east through townships 85 to 88 inclusive, together with certain township outlines, comprised my work of the past season.

From Selkirk we went north by boat to Norway House, thence by barge to Whisky Jack portage, across this portage and down Cross lake and Nelson river to Shoal falls. We portaged the outfit on the tramway to Sipiwesk lake and then went by canoe to Cross portage. After crossing this portage we followed Landing lake to where our season's work commenced on the 19th base at the Principal meridian.

On June 24, after retracing a couple of miles of the Principal meridian, we turned off an offset line to the east, at three chains south of and parallel to the 19th base line. This offset line was necessary because the intersection of the 19th base and the Principal meridian falls in Landing lake, and is witnessed by an iron bar and mound on the south shore four chains distant from the true corner.

The offset line was extended eastward across Landing lake a distance of a little more than eight and one-half miles, when the east mainland was reached. The azimuth of the offset line was carefully determined, and its length ascertained by laying off two base lines on the south shore of the lake, and from these base lines a double system of triangulation was extended down the lake to the point where the offset line struck the east shore. There a third base was opened and chained, to which the two systems of triangles were tied, in order to test the accuracy with which our triangulation had carried forward our standard of measurement. The test was very satisfactory. On reaching the first summit we opened a line north on which we established the position of the 19th base line, and after opening the line westward to the lake shore, we commenced its production eastward. It was continued without interruption until the NE. cor. tp. 72-5-E. was reached on July 29.

During the greater part of the work on this base line canoes were used for shifting camp, although three moves occurred involving back-packing, but even where the canoes were used quite a number of portages were necessary.

On July 29, the party returned to Nelson river, and the following day proceeded down the river and reached Split lake on August 1. On the 4th, we left Split lake with five Indians, bound for Landing river, and proceeded up Landing river to the fourth rapid, from where I sent three canoes with three Indians and three of my regular men back to Shell rapids to commence freighting down the Nelson. The remainder of the party pushed on to Surprise lake where we pitched camp about two miles east of the NE. cor. tp. 80-11-E. The following day, August 7, we began the production of the 21st base line, and it was continued eastward with all possible speed, until on October 13 the NE. cor. tp. 80-20-E. was reached. The country traversed is broken by innumerable lakes entailing many triangulations. Cyril lake and Fox lake owing to their size required very large triangles and much careful work. The transport over the first twelve miles of this base line was handled by canoes and only the portages necessitated back-packing. Then for a stretch back-packing was resorted to, until Cyril lake was reached, when canoes were again used



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until Fox lake was crossed. From the east shores of Fox lake back-packing was again necessary, the canoes being used only to take supplies down Fox river. Over this latter stretch of country a canoe had to be carried along the line, as many lakes were encountered during its production.

During this period of the survey the party was greatly handicapped for lack of regular packers. It had been necessary to leave one of my most reliable packers in charge of the Indians freighting from Shell rapids down the river to a cache they were placing just above Kettle rapids, and two others were busily engaged freighting from Shell rapids direct to camp. Moreover, as the waterways along Fox river route entail many long portages, these latter freighters and my camp transport were greatly delayed. The axemen and others of the party were therefore frequently required to assist the regular packers.

On August 21, I left camp to return to Winnipeg for my winter transport, and after a few days spent in hiring five more men to assist in taking the dogs down the river, I started north again. At Little Bull Head we picked up thirty-six dogs that had been purchased for me. Five more dogs were purchased below the lake and taken with the others down the river as far as Shell rapids. From this point the dogs were led along the right of way of the Hudson Bay railway to Landing river, where they were met by three canoes that had gone around by Nelson river, Split lake and Landing river. On October 8 we started up Landing river, and on the 17th reached Fox lake, where I left two men to fish for dog feed. On the 19th I proceeded down Fox river to try to reach camp with the winter outfit before freeze-up. After a trying journey we came up with the camp on the east outline of tp. 82-20-E.

On October 26, I sent a number of men back to Fox lake to bring in the dogs as soon as sufficient snow had fallen and the lake should be passable, for on the nights of October 24 and 25 some of the smaller lakes had frozen over. Two of the trains were to go to my cache near Kettle rapids after supplies, as we were running very low, and to rejoin the party after it would be moved up to the 22nd base line.

In the meantime we continued the east outline of range 20 north, and opened the theoretical jog to the east by November 2. Four dog teams had arrived the evening before, although the scanty amount of snow limited their loads very materially. The next day we commenced to move north to the 22nd base line, but owing to the soft snow that had fallen during the night, the dog trains could haul but very light loads. We were therefore compelled to back-pack the greater part of the outfit. Progress was very slow as it was necessary to double trip over the whole journey, for our outfit had been greatly increased by the addition of camp stoves and winter tents and clothing. It was not until November 6 that we at last pitched camp within two and one-half miles of the NE. cor. tp. 84-20-E.

The following day most of the party commenced work on the east outline of this township, while with three men and a dog train I started to open a trail west, to make a juncture with the trains bringing supplies from Kettle river cache. We made connections with these trains the next day, and returned to camp only just in time as the last of the flour was in the bake-pan, and we had been out of bacon and some other supplies for several days.

We completed the east outline as far as the 21st correction line on November 18, and then moved back to the 22nd base line, which we extended eastward to the Second meridian east, and by December 22 the meridian was surveyed north as far as the monument established by Mr. B. W. Waugh, D.L.S., to mark the intersection of the 23rd base line with the meridian.

Throughout this period the snowfall was comparatively light, and this, combined with the rough hummocky nature of the surface of the country, made the transport very hard on the dogs. Many of the dogs played out and not a few died on the long trips. As previously pointed out the summer freighting had been carried on under great difficulties, with the result that only actual camp necessities were brought down



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to the Kettle river cache. No cornmeal nor tallow were carried, as I felt that fish could be caught for part of the season at least. Three men were left at Fox lake to fish. All the dog feed had therefore to be hauled over these rough trails, and as the distance from Fox lake was rapidly increased the work of transporting feed and supplies became more and more difficult.

On November 27, I left camp to return to Shell rapids, to make arrangements for winter freighting, and did not again reach camp until December 13. On the journey, I met the engineer in charge at Port Nelson, and from him received an order for cornmeal and tallow at the Government cache at Limestone rapids, which is located about sixty miles up the Nelson from Port Nelson. He also furnished me with a description of the location of the Government cache at this point, and one near Angling river, but even with this information at hand, it took me four days to locate and open a trail to Limestone cache from my camp.

Between December 22 and February 18, the 23rd base line was extended across the first eleven ranges east of the Second meridian east, without any delays, although on occasions the progress was generally retarded, owing to the inadequate transportation facilities. On February 19, the east outline of range 11 was turned off to the north, and produced across townships 89 and 90. The theoretical jog was completed to the east on February 25 and on the following day we moved north to the 24th base line, commencing its production eastward. This line was continued as far as Hayes river, where we endeavoured to extend it across the river, but owing to the overflow caused by the tides we were compelled to abandon this part of the work. We accordingly returned to the north shore of the river, where we turned off a line parallel to the east outline of range 11, and produced this line south across the river, computing the distance across by means of a double triangulation. From here we opened a line east to its intersection with the theoretical position of the east outline of township 92, range 11. Here the east outline was turned off and first opened north to Hayes river, and then run south to the jog at the correction line. Work was completed on March 11; and the following day we moved back to York Factory.

During the interval between Christmas and the conclusion of the survey, we fed the dogs on cornmeal and tallow, part of which was hauled from Limestone cache and part from Port Nelson. Although this feed was closer than the fish, it was far from satisfactory, as both the meal and tallow were of an inferior grade. I therefore endeavoured to use a few fish along with the meal, but very few fish could be taken in Fox lake and our attempt to fish in Angling lake proved a failure.

My transport, from Christmas until February 19, when my men reached camp with dogs secured from Mr. B. W. Waugh, D.L.S., consisted of seven trains. And it was only the fact that I had received permission to draw one month's supplies for twenty men from Limestone and Angling river caches that made it possible for this small transport to handle the work. Moreover, the line was advanced rapidly eastward, necessitating frequent moves, and the scarcity of firewood made it necessary to haul wood, thus augmenting the already heavy work for the dogs. Throughout January what trains I could spare from time to time made trips to Port Nelson after supplies, so as to be able to keep ahead of the actual needs of the camp.

The advance on the 23rd base line eastward steadily increased the distance from the tote road north of the river, so that each trip to Port Nelson necessitated the breaking of new and longer trails from camp. However, with the arrival of Mr. Waugh's dogs, my transport was easily able to handle the work, and it was possible to send two hired dog teams back to Split lake.

On March 13, we left York Factory on our return, arriving at the end of steel on the 24th, and at Pas the following night. The next day I paid the party off.

About 240 miles of base line and meridian outlines, and about one and one-half miles of jog on the correction lines, were opened during a period from June 24, 1914, to March 11, 1915.



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The country traversed by the survey may be described according to the different base lines. The 19th base line passes through the best country met with during the survey. The country west of Nelson river is much broken by Landing and Sabomin lakes, and numerous smaller lakes. In the immediate vicinity of the lakes the land is low and tends toward muskeg, but back from the water areas the surface rises gradually, forming land much more suitable for farming. The soil is usually a deep clay overlaid by a few inches of moss. Landing lake is a beautiful rock-bordered body of water probably thirty miles long and from one to one and one-half miles wide. The water is exceedingly clear and abounds with whitefish. Sabomin lake is only four or five miles long. The timber throughout this area is stunted, although fairly thick, and consists largely of spruce from three to six inches in diameter. A few larger spruce are to be found in a fringe about the lakes and on the islands. Nelson river is crossed by the 19th base line in sections 33 and 34 of range 4 east. It is here thirty-eight chains wide, with a very swift current. The western bank is quite precipitous and very rocky, while the eastern slope is very gradual. East of the river fewer lakes are met, and the surface, although almost level, is covered with very hummocky moss and is very much wetter in places. A large portion of this section is covered with small fire-killed spruce, and the surface soil has been seriously damaged by repeated fires.

The 21st base line passes through nearly level country in range 12 east, with the result that it is mostly one continuous muskeg, covered with small stunted spruce and tamarack. It is broken by Surprise and War lakes, the latter of which abounds with whitefish. In the eastern part of the range, burnt country is met and much standing, fire-killed spruce appears. The luxuriant growth of wild berries testifies that the surface soil has not been injured by the recent fires. This portion of the country is very suitable for agriculture, with a deep clay soil covered by a very shallow layer of moss. Farther to the east many small lakes are met but only those connected with Fox river have any whitefish. Cyril river traverses ranges 13, 14 and 15 just a short way south of the base line. This river is only about fifty or sixty links wide, and at low water is not very suitable for large canoes. In low water the river above Cyril lake has many rapids necessitating frequent portages some of which are almost one-half mile long.

Cyril lake is crossed by the line in range 15. It is about four to five miles long and one and one-half miles wide. Just to the north of it, a high jackpine ridge occurs to break the otherwise regular surface, while still farther to the north extensive swamps appear. The country between Cyril and Fox lakes is nearly level, broken here and there by small lakes. The surface is low and swampy, and although drainage is possible, and clay is to be found below the muck, the land will be of little value for many years. Small spruce and tamarack give place occasionally to fire-killed timber.

Fox lake is crossed in ranges 17 and 18 east. This is a fine body of water with an irregular shore line, It is seven or eight miles long and from two to three miles wide. Whitefish, jackfish, pickerel and sucker abound in its waters, but owing to the many shallow bays it is difficult to locate them in mid-winter. Fox lake discharges its surplus waters through Fox river, which is several chains wide near the lake, but after following a sluggish meandering course for two or three miles it narrows down to a stream about two chains wide, with exceedingly swift water. During the fall of the year when the water is low, it is a very bad river for canoe work, as its bed is full of boulders, and the current is so swift that one is either stranded upon a boulder, or else by it before it can be seen. The whitefish are easily taken about the end of September by damming this stream at a rapid, and catching the fish in a willow basket.

The country lying east of Fox lake is broken by many small lakes. The surface is somewhat irregular, owing to the occurrence of low ridges, which are generally covered with small jackpine. Elsewhere small spruce and tamarack appear. The soil is



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a clay overlaid with varying depths of moss and black muck. Small areas are very suitable for farming, but the largest part of the country requires draining.

Range 20 is traversed by Thick Bush creek as it flows south into Fox river. Along its banks is to be found a fringe of good spruce, some trees reaching a diameter of twenty-eight inches.

The country traversed by the east outline of range 20, through townships 81 and 84 inclusive, is generally very wet and swampy. A jackpine ridge breaks the swamp in township 82, while township 81 is broken by three marsh-bordered lakes. This section is very undesirable, while townships 83 and 84 are in parts so wet as to be almost impassable in summer.

The 22nd base line across ranges 21 and 22 east runs through better country. It is broken by tributaries of Angling river, which probably accounts for the drier surface.

The Second meridian east across townships 85, 86, 87 and 88 traverses considerable swampy country. To the east of the meridian Angling lake breaks the otherwise regular surface. This lake lies in a northeasterly and southwesterly direction, and is about eight miles long by one-half mile wide. Whitefish, jackfish, trout and sturgeon are to be found in its waters, although efforts to catch them in midwinter were unavailing. Considerable burnt country adjoins this line; and the frequent fires have materially impaired the soil. Clay underlies the moss and black muck in all sections. In section 14, township 87, Nelson river is crossed. It is here fifty-one chains wide with a very swift current, as testified by the manner in which the ice was piled up five to eight feet at this crossing. It required the work of three men nearly a whole day to cut a dog trail across the river on account of the rough ice. The clay banks are between eighty and one hundred feet high.

The location line of the Hudson's Bay railway is crossed in section 2, township 88. The country north of the Nelson adjoining the railway is nearly level. Frequent beaver dams occur, thus creating flooded areas. The timber is fire-killed in places, with the remaining areas covered with stunted spruce and tamarack. The otherwise regular surface is broken by slight rises, forming islands of drier land covered with a denser growth of spruce.

The 23rd base line east of the Second meridian east, traverses country very similar to the above. In section 32, township 88, range 2, Nelson river is again crossed. The approach from the west parallels a small creek and is therefore gradual, while on the east side the line leaves the river by ascending a very steep bank. The banks along here are from eighty to one hundred and twenty feet high with frequent steep clay cut banks. A narrow fringe of fair timber is found at intervals in the valley, with some rather good pulp timber in other places.

The country east of the Nelson, is comparatively dry until after Angling river is crossed in section 32, range 3, but small spruce and tamarack is still the prevalent growth. A great many small lakes break the regularity of the surface. These lakes are generally connected by small creeks so narrow as to be useless for canoe transport. The soil is clay overlaid with several inches of moss. Occasional open swamps adjoin the lakes. Angling river is a winding stream two chains wide, flowing in a valley about fifty feet deep. The fall over a length of about thirty miles between Angling lake and Nelson river, is approximately 200 feet, with the result that the current is very swift, necessitating almost continuous tracking when going up-stream. East of Angling river the country is nearly level, and large swamps are more frequent, many of which are connected by small creeks. The soil is largely a moss-covered black muck, eighteen to twenty inches deep, overlying a yellow clay. In many of the pits, water appeared before the depth of eighteen inches was reached. Stunted spruce and tamarack appear everywhere except on the open swamps. Occasional belts of brule were crossed where the surface has been dry enough to allow the fires to run. Owing to the depth of snow



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over these areas it was difficult to ascertain how badly the surface soil has been damaged by the frequent fires.

In section 36, range 8, the line crosses Penny-Cuttaway river. This stream which is six chains wide, follows a very winding course in the bottom of a narrow valley about seventy-five feet deep. A fringe of fair timber, mostly spruce, is found in the valley. This river rises near where Fox river empties into the Hayes, and after a most meandering course, roughly parallel to the Hayes, it discharges its waters into this river about three miles north of the base line. It is very difficult to determine just where the height of land between Nelson and Hayes river watersheds crosses the line.

Hayes river is crossed in section 32, range 9. Occasionally the steep banks recede in gradual slopes from the bed of the river, but elsewhere a forty-foot bank rises on either side. Clay cut banks occur at intervals, and innumerable springs break through the foot of the slopes, making the edge of the river bed almost a continuous sloping ice sheet in winter. Some fair spruce suitable for building purposes grows in the valley. The Indians from York Factory have for many years cut their timber up this river and its tributaries, and after rafting it down to York, have whip-sawed it for building purposes. The current of the Hayes is very swift as testified by the rough ice. In fact a great deal of tracking is necessary when going up-stream. A few small rapids occur between York Factory and the mouth of Shamattawa river, but none that would prevent the rafting or driving of sawlogs.

The country east of Hayes river adjoining the 23rd base line is very undesirable, consisting chiefly of extensive swamps, broken by small islands of higher ground. These swamps extend eastward beyond range 11 east, and south probably ten miles, and to the north almost to Hayes river. It was plainly evident that this district would be practically impassable in summer. Stunted spruce and tamarack grow where the open swamps give place to bush land.

The country traversed by the east outline of range 11 is very similar to that traversed by the last two or three ranges of the base line. Hayes river is crossed in section 25, township 92, and being within about three miles of its outlet it is about two miles wide at this point. The tide waters from Hudson Bay affect the water level of the river for a distance of about twelve miles up the river. In usual tides the change in level is about eight feet, while in spring tides the water rises fifteen feet above ordinary level.

The 24th base line across range 11 east runs along the long point between Nelson and Hayes rivers. The land is very level and is largely one extensive tamarack and willow swamp. Hayes river is reached in section 35 of this range. York Factory lies partly in sections 21, 22, 27 and 28 of township 92, range 11. It is quite a large Hudson's Bay post, comprising in the reserve about 177 acres. It was surveyed in 1901. Several very large buildings give the post quite an imposing bearing. These extensive structures speak in no uncertain manner of the amount of supplies that once entered the interior of western Canada by way of this natural gateway. For years before the railway reached Winnipeg, supplies were brought across from England in the Hudson's Bay company's boats and landed in York Factory. These supplies were handled in York boats by way of Hayes and Nelson rivers. Many tons of supplies were taken up Hayes river to the Nelson and thence up the Nelson to Warren's landing. From this point many tons were taken across lake Winnipeg to old Fort Garry, while other supplies were taken across to Grand Rapids and hauled across the long portage and started on the journey up the Saskatchewan, to such posts as Pas, Prince Albert, Fort Saskatchewan, etc. York Factory was thus a flourishing post before Winnipeg was even dreamed of. However, with the advent of the railway through the west, York Factory lost its prominence and many of the Indian families whose men depended on the summer transportation for employment, moved farther inland to the interior posts at Split lake, Cross lake, Nelson House, Oxford House and Norway House, where hunting and trapping were more plentiful.



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Port Nelson is situated about one mile north of the 24th base line in range 9 east of the Second meridian east, on the north bank of the Nelson within only a few miles of the mouth of the river. Port Nelson is to be the terminal of the Hudson Bay railway. Work was in progress on the construction of harbour facilities, about 500 men being employed.

The only residents of this country are at present located at the several Hudson's Bay company's posts and at Port Nelson. The Hudson's Bay company's posts at Norway House, Cross Lake, Split Lake and York Factory are comprised mostly of the Indians gathered about the posts. Split Lake post is situated on the north shore of Split lake, and about twenty-five miles north of the 21st base line, roughly in range 9 east of the Principal meridian. The Indian population probably numbers about 300. At Port Nelson there is a large transient population, but only a few permanent residents.

The climate throughout the district is sufficiently uniform to consider it as a whole. Throughout the summer the days are very warm, and the nights are quite cool. The daylight, however, is exceedingly long with the nights correspondingly short. Summer frosts occurred in May and June and again in August and September.

The winter, extending as it does from the latter part of October until well on into April, is rather severe. Last year was regarded as the most unusual year, the amount of both the rainfall and snowfall was below the average, while the temperature throughout the winter was much higher than the general average. In the winter of 1913 and 1914 the meteorological reports at Port Nelson give an average of possibly 30 degrees below zero for the months of January, February and March, while during last winter the average for the same period would be less than 20 below, the severest record at camp was 54 degrees below zero. Port Nelson recorded 59 degrees below zero that same night.

The summer weather indicates that the climate is not very suitable except for the most hardy growth, although lettuce, radishes, potatoes, onions, turnips and cabbage have been grown at Split Lake post. Potatoes of small size, and a few other hardy vegetables have been grown at York Factory on a clay soil that has been hauled from the river banks to replace the moss and black muck on the surface.

The resources of the country, covered by the season's survey consist largely in water-powers and fur-bearing animals. Almost all kinds of fur-bearing animals found in Northern Canada are to be found here. Beaver, mink, marten, muskrat, otter, weasel, wolves, and foxes, including red, cross, silver, and white, are to be found in the district. The white foxes, however, are found largely along the coast, while the others keep more to the interior. The Indians generally make a rich fur catch each winter.

A few moose and caribou are to be found in the district. The barren land caribou or husky deer usually migrate south early in the winter, crossing the Nelson at Split lake and Gull Lake. Few ducks and geese frequent these lakes in summer and even the partridges and the ptarmigan are not plentiful.

As already stated, numerous rapids are met on all the rivers and streams. During the summer of 1914 and the winter of 1914 and 1915 the Manitoba Hydrographic Survey had a party metering and cross-sectioning Nelson river about four miles above Shell rapids, but their figures will omit the additional discharge from such rivers as the Armstrong, Landing, Grass, Burntwood, Ripple, Butnau, Kettle, Limestone, Angling and Kisemaguskun. Again, each one of these tributaries of the Nelson has numerous falls, which, if dammed, would produce considerable horse-power. No estimate has been made of the discharge of these rivers so that it is impossible to give even a rough approximation of the possible power development.

Fox river, as previously stated, has many rapids, and although the discharge is small, the fall over these is very considerable and much power might be developed.





Photo by J. R. AKINS D.L.S.

#### LAUNCHING SCOW AT PEACE RIVER CROSSING.

For transportation on Peace river, scows are built, during the winter, on the shore just beyond high-water mark, and they are hauled down to the river when the ice moves out in the spring. They have a carrying capacity of twelve ton, and require the united efforts of fifty men to drag them along the skids to the water.



Photo by J. R. AKINS, D.L.S.

#### CAMP ON MEANDER CREEK—PEACE RIVER DISTRICT.

This view illustrates the open country found along the Hay River trail. Meander creek crosses the base line in tp. 112-20-5 and empties into Hay river farther north. Cherries and saskatoon berries grow in great profusion. The same kind of country extends almost all the way from Vermilion to the Hay River post, a distance of 100 miles. At places, the open country is several miles wide.







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Hayes river too has frequent rapids, but with a much larger discharge. Its available horse-power would therefore greatly increase the estimate for this northern country.

Very little can be expected in the line of merchantable timber. The construction of the Hudson Bay railway will require much tie timber, and a great many piles, but the greater part of these will have to be brought in by rail. Port Nelson too will require an enormous amount of pile and crib timber, and this also will have to be brought in, although the railway company has been attempting to take out some logs along the Kisemaguskun river.

In the western part of the territory covered by the survey, rock outcroppings occur at frequent intervals. The shore-line of the larger bodies of water such as Sipiwesk, Landing and Split lakes is largely solid rock. Rock outcrops along the Nelson as far down the river as the last limestone rapids. Below this point the banks are clay. This entire absence of rock throughout the district for sixty miles surrounding Port Nelson, is going to be a serious handicap in the construction of harbour facilities. A belt of Huronian rock carrying narrow quartz veins outcrops on some of the islands in Split lake; but whether larger veins carrying mineral values will be found later can be determined only by careful prospecting.

Brief mention might be made of the abundance of fish to be found in portions of the country traversed. Landing, Split, Butnau, Moosenose, and Fox lakes abound in beautiful whitefish, while in Kettle, Sipiwesk and Angling lakes they are to be found in smaller numbers. Sturgeon can be caught in Sipiwesk and Angling lakes and in Nelson river, and trout below Kettle rapids. In the fall, before the ice starts to form, immense schools of a kind of herring come up the mouths of Nelson and Hayes rivers. No attempt has been made to catch these at Port Nelson, but many of them are put up for winter dog feed at York Factory. During certain periods in the summer numerous white whales enter the mouth of the Nelson going up with the tide and down with the ebb.

Since the spring of 1914 the means of entrance to this district has completely changed. With the extension of the Hudson Bay railway to Manitou rapids practically all travel into this district will be by rail. On March 27, 1915 the steel was laid about 220 miles beyond Pas, and should reach Manitou by June. The bridge across the Nelson at this point will probably require the remainder of the summer to complete. Therefore travel to Port Nelson will still follow the river from Manitou rapids. The current from there on is very swift with very frequent dangerous rapids to pass, so that none but experienced canoeemen should undertake the trip. The trip up-stream from Port Nelson is very arduous, and considerable tracking is necessary.



## APPENDIX No. 37.

## ABSTRACT OF THE REPORT OF H. S. HOLCROFT, D.L.S.

## SURVEYS AT FORT CHURCHILL.

To reach Fort Churchill we travelled from Pas by construction train on the Hudson Bay railway to the end of steel, a distance of about eighty-five miles. From there we travelled with two hired teams and five dog teams to the end of the tote road, about 155 miles farther; at this point the teams turned back and we proceeded with dog teams along the right of way. When this could be no longer followed we struck across country toward Port Nelson. The country became rougher and more hilly, and our progress which was from ten to thirty miles daily, depended principally on the depth of the snow. Sometimes we were forced to lay up on account of wind-storms, as the temperature was considerably below zero and the snow was deep. Even with these precautions every one was badly frost-bitten on the trip. Close to Port Nelson the woods became lighter and we had some difficulty in getting dry wood for night camps. We rested the dogs at Port Nelson for a few days and resumed our journey on April 5. As we had a good Cree guide we took a direct line to Fort Churchill, not following the coast, as is usually done. At first the snow was deep and no trail was open, so we made poor time, but on the following day we began to strike the open places in the barren lands, and as the snow there was beaten hard by the constant northwest winds, travelling improved.

We passed over a considerable area of barren lands during the trip to Fort Churchill, and as the wind was frequently blowing we were delayed four days, during which time we had to remain in our tents. Fortunately the guides knew the country and camped at places where we could get a little shelter and lots of dry fire-wood. We arrived at Fort Churchill on April 13.

It was not yet possible to start the survey, so we stayed with the Mounted Police on the west peninsula and employed our time in getting firewood for my intended summer camp across the harbour on the east peninsula.

On May 28, I started to survey the townsite on the east peninsula, but I could do very little work, as the weather was very stormy and the snow too deep. It was not until after the first week in June that we could work regularly, and all during the summer there were frequently stormy days on which we could not work at all. The wind blew almost continuously and we had considerable rain. We had a snow-storm on June 10, and on the 12th there was so much snow that we had to wear snow-glasses.

After having completed the survey on the east peninsula, I moved across the river by canoe and again stayed at the Mounted Police barracks. From there I laid out the property for a police reserve and resurveyed the Hudson's Bay company's claim, about four miles south of the police barracks.

The Hudson's Bay company's supply boat arrived on August 20 and as I had completed the necessary work, I decided to go on it to York Factory, and at Port Nelson get an outgoing steamship to North Sydney, Cape Breton.

I accordingly sold my dogs and outfit to the Hudson's Bay company at Fort Churchill, and left by boat for York Factory on August 25, arriving there the following evening.

On September 3, the Royal Northwest Mounted Police whaleboat took us to Port Nelson, about twenty-five miles around by the sea, and on the following day we boarded the steamship *Sheba* and sailed about noon on the 5th.



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We arrived at North Sydney on the 14th and stayed there two days waiting for transportation and cash. I then paid off the party and gave them tickets to Winnipeg and proceeded to Ottawa myself.

The country around Fort Churchill is almost barren, though near Churchill river there is considerable spruce and some tamarack. The townsite on both peninsulas is barren, being either rock or rough country, mostly gravel. Grass grows in some places, principally around the edges of rivers and lakes.

We saw many small birds of different varieties, such as robins, song sparrows, etc., and large birds such as rooks, a few crows and owls. Geese and ducks of all northern varieties, snipe, plover and woodcock were also plentiful.

The summer is short in this district, beginning about July 28 and lasting only about six weeks. The spring is cold and wet, but the climate seems to be healthy.



## APPENDIX No. 38.

## ABSTRACT OF THE REPORT OF W. J. JOHNSTON, D.L.S.

## SURVEYS IN KAMLOOPS DISTRICT, BRITISH COLUMBIA.

The work on which I was engaged during the past season lay principally in the vicinity of Sicamous.

From Enderby we travelled east to tps. 18 and 19-6-6 where we ran some subdivision lines, traversed Hidden lake and surveyed three miles of the south limit of the railway belt. We then went to Mabel lake and subdivided parts of tps. 19 and 20-5-6. Mabel lake affords some excellent fishing and game was plentiful in the vicinity, twenty deer and a few bears being seen by our party.

Leaving Mabel lake on July 6 we moved to tp. 21-12-6. While in this vicinity we laid out a park site for the Chase Board of Trade, traversed part of Chase creek and subdivided parts of townships 21, ranges 12 and 13. This work was completed on July 27.

Chase creek runs through a canyon 1,500 feet deep on one side and 500 feet on the other. A good road runs from Chase as far as Chase creek in sec. 30, tp. 21-12-6 where it divides, one part going south to China valley, and the other east to Squilax. Both roads are in good condition. The soil is a sandy loam and very dry. There is very little rainfall and irrigation will have to be adopted for better results in farming operations.

On July 28, I moved to Malakwa, in tp. 23-6-6. The work in this township consisted of subdividing the sections into legal subdivisions. Work was done also in townships 22, ranges 6 and 7. In all, about fifty miles of subdivision and retrace-ment were run in these townships. Eagle river runs through all three townships, and the valley is about a mile wide on either side. I was able to move my camp by wagons, hired locally, as a good wagon road runs from Solsqua to Craigellachie.

On September 8, having completed this subdivision, I moved camp by rail to Revelstoke, where I obtained three large canoes and commenced a stadia traverse of Columbia river and islands, from Revelstoke to the southern limit of the railway belt. This was completed on October 12. While on this work some subdivision was done in tps. 22 and 23-2-6 and in tp. 22-1-6. Several sections were cut up into legal subdivisions. A wagon road is being built from Arrowhead to Revelstoke, but it will not be completed for several years. There are quite a number of settlers, along Columbia river, who are gradually getting their homesteads cleared. The soil is a sandy loam, suitable for general farming.

My next work was in tp. 23-1-6 which was reached by wagon from Revelstoke. Section 31 was surveyed into legal subdivisions. Most of the township is mountainous.

On completion of this work, camp was moved by rail to Chase where I divided my party, one assistant going south by wagon to tp. 20-12-6 where a school-site was laid out on Charcoal creek, while the remainder of the party went by launch to Celista in tp. 23-10-6. A townsite was laid out along Shuswap lake in section 9, through which a new government road runs. The land in this township is being rapidly settled.

On October 27 camp was moved, by launch, to tp. 22-12-6. The boundaries of section 26 were retraced and re-established, and the left bank and islands of Adams river were traversed. The course of this river has changed considerably since the last traverse was made, and these changes have formed several islands in Little Shuswap Lake Indian reserve No. 1. On October 31 I moved camp to Chase by launch, and disbanded my party, and the following day with one assistant, I left for Revelstoke, where I made a tie between a concrete longitude monument and the east boundary of sec. 34, tp. 23-2-6.

On November 5 I returned to Vancouver, having completed my season's work.



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## APPENDIX No. 39.

## ABSTRACT OF THE REPORT OF G. J. LONERGAN, D.L.S.

## INSPECTION OF SURVEY PARTIES WORKING UNDER DAILY PAY.

My first work was in northern Manitoba in the vicinity of Pas.

This town has now a population of about 1,500 and is equipped with modern improvements such as waterworks, a sewage system and electric lights. The Finger Lumber company has there one of the best equipped sawmills in western Canada, employing about 300 hands. Most of the logs are brought in on Saskatchewan river.

The Hudson Bay railway has in operation a mixed train service from Pas to the end of steel, about 170 miles north, and the grade is completed about sixty miles farther. The country from Hudson Bay Junction on the Canadian Northern railway to about 160 miles beyond Pas is mostly low and flat and is covered with about two feet of moss. The timber on this area is mostly scrub, spruce and tamarack with occasional poplar ridges. Some spruce is large enough for milling. Many lakes are scattered through this district and all of them contain fish. No trails of any consequence exist and horses are of little use. Transportation is carried on by means of dogs in winter and canoes in summer.

When the work in northern Manitoba was completed I went to British Columbia and inspected eight parties working in the railway belt. Upon the death of Mr. A. E. Hunter, D.L.S., who was drowned in Nahatlatch river, I took charge of his papers and placed his assistant, Mr. W. H. Norrish, D.L.S., in charge of the party.

I then returned to the prairie provinces and inspected a number of parties working there. I visited in all thirty-one survey parties, investigating all details such as the kind of board supplied to the men, the suitability of the men for the work they were performing, the condition of the transport and the price paid for it, the manner in which the field work was performed and the condition of the field notes and diaries. All the chains were tested and the condition of all instruments used was reported on.

In travelling over the country I was agreeably surprised to find that large areas of land which eight or ten years ago were only grazing leases are now dotted with homesteads; old trails which used to run across the country are replaced by graded roads which follow the regular road allowances; old fords of creeks are now substituted by steel bridges, and many towns have sprung up and become business centres. Telephones are installed in most of the farm houses; rural mail delivery has been established and all the communities show progressiveness. Farmers are also going into mixed farming to a great extent and are erecting more comfortable dwellings and out-buildings. The planting of trees and shrubs is also receiving more attention, and some of the homes have a very attractive appearance.



## APPENDIX No. 40.

## ABSTRACT OF THE REPORT OF H. MATHESON, D.L.S.

## TOPOGRAPHICAL SURVEYS NEAR JASPER.

Jasper is situated in tp. 45-1-6, on a broad flat near the junction of Miette and Athabaska rivers. It is the administrative centre of Jasper park, and is on the main lines of both the Grand Trunk Pacific and Canadian Northern railways, being the second divisional point west of Edmonton on the Grand Trunk Pacific. It consists of a fine park administration building, artistically constructed of boulders, also three stores, and numerous small but generally attractive dwelling-houses. The tents and rough shacks built during the days of railway construction, before the townsite was surveyed, are gradually disappearing. The population of Jasper consists mainly of people employed by the Parks Branch and employees of the Grand Trunk Pacific railway.

In the latter part of 1913, I had commenced the survey operations necessary to make a topographical map, on a scale of ten chains to an inch, of an area in the valleys of Athabaska and Miette rivers, approximately five miles below and five miles above Jasper, and had surveyed many of the lakes and waterways, by means of the transit and stadia. In 1914, I completed the work, using a plane-table.

My topographical surveys were controlled by the section lines of the township subdivision. The sections were divided into smaller areas by transit stadia traverses. The section lines and traverses were plotted on the plane-table sheet in camp, and the elevations of the stations marked. The stations were then occupied by the plane-table. Stadia readings were taken on suitable points with the telescopic alidade, and the points plotted on the plane-table. The stadia readings were reduced in the field by means of a slide rule, and the contours were sketched on the map in the field. The table was oriented by means of the magnetic needle. Besides occupying stations already located, traverses were also run by plane-table and stadia, closing on the transit traverses or section lines. By these means the whole area was surveyed and contours with intervals of ten or twenty feet, depending on the nature of the country, were accurately located. Shores of lakes and rivers were traversed by transit and stadia, and plotted on the plane-table sheets in camp. As data for levelling, I used the Grand Trunk Pacific railway bench-marks. From these, lines of levels were run along roads and trails throughout the area surveyed, and bench-marks were established on which I checked my traverses whenever convenient or necessary. The plane-table work required four men, consisting of a topographer, a recorder and two rod men.

During 1913 and 1914 much development work was done in Jasper and vicinity by the Parks Branch. The streets of the town have been graded and gravelled, and a wagon road has been constructed to Patricia and Pyramid lakes, two magnificent sheets of water more than a mile long in the hills north of Jasper. An excellent automobile road, which winds by many beautiful small lakes, has been constructed as far as Maligne gorge. Pack-trails have been constructed almost to the summits of Goat and Maligne mountains, to Caledonia, Cabin, Medicine, Maligne and Jack lakes, and to many other parts: a temporary wooden bridge has been constructed cross Athabaska river near Jasper. Packers and guides, competent and fully equipped to take charge of tourist parties, are now located at Jasper, and it is possible to travel comfortably from Jasper road along good roads and trails into some of the finest mountain scenery in America.



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The area surveyed included the flats of Athabaska and Miette rivers, and the rolling country between these flats and the mountains. One of the most noticeable features of the area is the large number of small lakes scattered over it. This is, of course, an important asset to the attractions of the district, and full advantage is being taken of it by the Parks Branch in the development of this part of the park. All roads are so located that they touch at least a portion of the shore of every lake situated in the general direction of the road. Many of the lakes have no outlet or inlet, and are only large ponds, while others have outlets and inlets either on the surface or underground, and some of the latter contain fish. The best fishing is to be found in Caledonia lake, which in summer is visited almost daily by residents of Jasper and by tourists. Pyramid lake and Athabaska and Miette rivers also provide good fishing.

Maligne gorge, a narrow canyon on Maligne river, is one of the most important scenic attractions in the vicinity of Jasper, and is included in the area surveyed. Its distance from Jasper by road is about ten miles. Maligne river flows northeasterly from Maligne lake, and enters the Athabaska about four miles below Jasper. The gorge is about a mile above its mouth, and just above the point where Maligne river enters the flats of the Athabaska. The gorge, which is approximately half a mile in length, is in places not ten feet wide at the top, but has been eroded by the action of the river water on the soft sedimentary rock to a depth of more than a hundred feet. The river enters it by a cataract and a fall of about seventy-five feet. It is remarkable that only a small portion of the water of Maligne river flows through the gorge. The stream flowing through the gorge is only about twenty feet wide in high water, above its entrance to the gorge, and it is said to become dry in winter. The main volume of the water flows underground about eleven miles from Medicine lake to a point just below the gorge, where it comes to the surface and with the water which flows through the gorge, forms a river about a hundred feet wide. Near the gorge, a rest house has been built, and a trail has been constructed leading up to Medicine, Maligne and Jack lakes. A foot bridge has been constructed across the gorge in such a position as to afford a good view of the falls and the bottom of the gorge.

I completed topographical work in the vicinity of Jasper on October 21 and then moved my outfit to Pocahontas by train. Thence I moved by wagon to tp. 49-26-5 where I surveyed a block of land consisting of eleven legal subdivisions, to be leased to the Northern Alberta Coal syndicate. It was necessary to run nearly six miles of section lines, on most of which the cutting was very heavy.

I completed the above work on November 3 and disbanded my party, and after surveying a corral near Jasper, and placing some iron posts in Jasper townsite, I closed operations for the season.



## APPENDIX No. 41.

## ABSTRACT OF THE REPORT OF P. MELHUISH, D.L.S.

## SURVEYS IN THE NEW WESTMINSTER DISTRICT, BRITISH COLUMBIA.

My season's surveys were begun at Bedwell bay where I retraced road traverses, and marked lot and block corners of the additional subdivision at Woodhaven.

On June 2, I moved to Pitt lake to make a survey of a parcel of land in secs. 18 and 19, tp. 5-4-7. This land was required for industrial purposes, water-power being available from Raven creek.

We next moved to Harrison Mills in tp. 3-30-6 and produced the Seventh meridian northerly to the northwest corner of section 29. After completing other section lines to the north of Harrison bay, and retracing the boundaries of Harrison River Indian reserve No. 3, we ran the east boundaries of sections 21, 16 and 17, and the north boundaries of sections 15 and 16, over the mountain between Harrison bay and Fraser river. Part of my work in this township was to traverse both banks of the Fraser and all the islands in the river which had not been previously surveyed. At this time, however, the river was in flood, and I considered it would be more expedient to do this work later in the season when the river would be easier to cross.

On July 20 I moved from Harrison bay to the south end of Harrison lake, where I pitched camp in tp. 4-29-6. Several section lines were surveyed and retraced in this township and a small parcel of land was surveyed on the west shore of Harrison lake. This land was required for the building of a summer house and is very desirable for this purpose. Some good land in sections 12 and 13 has never been cleared. There is a hotel and a small village at Harrison Hot Springs and motor stages meet the trains at Agassiz station.

The next work, in tp. 3-28-6, consisted in traversing a part of Maria slough and running section lines to close this traverse. There is some good soil in the west halves of sections 24 and 32; the land is all on the mountain sides but the soil is a deep chocolate loam. In the middle of August it contained ample moisture, after six weeks of dry weather. The mountain side has been burned over and there is a fairly heavy growth of birch and alder. The land around Agassiz is being steadily improved and presents the appearance of a thriving community of farmers. On August 14 camp was moved to Fraser river in section 18. From this camp four islands in the river were surveyed in sections 15, 16 and 18.

On August 19 I moved the party back to Harrison Mills where the work which I had left a month before on account of the water being at its height, was taken up again. Some ten islands in the Fraser, and the banks of the river in sections 23, 24 and 13 were traversed. Several section lines were surveyed and corners which had been washed away by the river were re-established in safe places. The action of Fraser river in removing land from one place and building it up in another is extremely rapid and difficult to predict. The river drains a large snow-covered area and is very swift. The last abnormally high water was in 1904, and owing to dredging operations near the mouth, similar conditions are not expected to occur again. The fact that there is a possibility of almost any of the islands in the river being flooded has probably been the cause of settlers not taking up this land. The soil on the islands is sandy loam, but with proper cultivation it would be suitable for agriculture.



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The sequence of growth on land which is being built up on the Fraser seems to be invariably the same, namely: willow, alder, cottonwood and cedar. Some of the islands have very large cottonwood trees whose roots help to hold the soil in its place. Cottonwood is valuable, and when dry is hard and almost impossible to split. It is used for making furniture and boxes. There is a sawmill situated in tp. 24, E.C.M., which saws this wood exclusively.

On September 20 I moved camp from Harrison Mills to Coquitlam river to survey timber berth No. 562 and also part of the north boundary of tp. 39, W.C.M. The northeast corner of section 33 was 3,000 feet above the camp. The berth contains some very fine cedar, ranging from two to six feet in diameter. There is a heavy growth of sound hemlock, but the fir is scattered. Logging roads can be built through the berth, as the ground in most places is not unfavourable to logging operations. While surveying this timber berth the rain and fog rendered the work exceedingly slow. This district has an exceptionally heavy rainfall. During the time that we were there, between September 21 and October 25, inclusive, the total rainfall at Coquitlam lake was 18.53 inches. The survey of the berth was finished on October 25, when the party was moved back to Harrison Mills. Camp was pitched in tp. 3-30-6 and that part of Queen's island situated in this township was traversed, together with the right bank of Fraser river in sections 9, 15 and 16, and the left bank in section 14.

On October 31 the party was moved to Harrison Mills and paid off, and after correcting the position of some posts on the resurvey of Langley townsite I closed operations.

The weather in the months of June, July and August was very good for survey operations, but rather too dry for the farmer. The rainy season started on September 7 and from that time on more rain than usual fell. From April 23 to September 6 three days were lost on account of rain, while from September 7 to October 31 twelve days were lost.



## APPENDIX No. 42.

## ABSTRACT OF THE REPORT OF R. B. McKAY, D.L.S.

## LATITUDE OBSERVATIONS IN NORTHERN ALBERTA.

During the past season I observed for latitude on the Fourth meridian near lake Athabaska, on the Fifth meridian near where it crosses Peace river, and on the Sixth meridian near the 21st and 23rd base lines.

The party consisted of myself and one assistant, and for transport we had a canoe, a small dingey and a portable gasoline motor which could be readily attached to the dingey.

Leaving Athabaska on May 8 we overtook the Hudson's Bay company's transport at Grand Rapids, and transferred our outfit to their scows for transport through the rapids. We reached McMurray on May 23, where we left the Hudson's Bay company's scows and proceeded down the river in our own boats, reaching lake Athabaska on the 30th.

The ice on the lake detained us for a few days, but on June 6 we left for the Fourth meridian, and, after travelling through twelve miles of ice, reached the meridian five days later.

The land in this vicinity is fairly level, dry and sandy, and is partly covered with jackpine, which has recently been burnt over. Several small hay meadows lie along the valley of a creek which enters lake Athabaska near the meridian. These places appeared to be a breeding ground for mosquitoes which were very plentiful, active and annoying during my stay at the meridian. Foxes are quite numerous in the district, but no other game was noticed.

I completed my observation here and started for Chipewyan on June 27. The water in the lake was considerably higher than it had been two weeks previous, and not so clear, as Peace river was sending large quantities of drift-wood into the lake. Being favoured with calm water, I reached Chipewyan on June 28, making the trip from the meridian in seventeen hours actual travelling.

Chipewyan is a trading centre for the Chipewyan and Cree Indians who trap and hunt in the vicinity of lake Athabaska. The land included in the settlement is very rocky and although a few patches of potatoes are grown, very little of it can be used for gardening. There is plenty of game and fur in the district and the lake abounds in fish, thus making it an ideal country for a hunter or trapper.

On July 4, I left Chipewyan for the Fifth meridian on the Hudson's Bay company's steamer *Grahame*, which was making its annual trip to Vermilion chutes on Peace river. The route taken to reach Peace river was through the Quatre Fourches channel which is about 200 feet wide and connects lake Athabaska and Mamawi lake with Peace river. The country it runs through is low and flat, and timbered with patches of good spruce, while large quantities of hay are found around the shallow lakes to the west. The lower part of Peace river traverses a rich agricultural country, and its banks and the islands in the river are well timbered with spruce, birch and poplar, and vast prairies with unlimited hay meadows exist a short distance from the river on either side. Large quantities of gypsum are exposed in many places on both banks, particularly near Peace point. At what is called Little rapids, the current is very swift while the water is shallow with a gravelly bottom; these rapids, however, are navigable except at low water. The banks as a rule are low and are frequently



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undermined by the strength of the current at high water, which occurs in the latter part of June. I left the steamer *Grahame* about six miles west of the Fifth meridian and with my outfit drifted down stream to the line, choosing the place of observation on the north bank of the river. The current there is about three or four miles an hour, and the banks which are well timbered with spruce, birch and poplar, are about twenty feet high. Thunderstorms and showers were quite frequent during my stay, and the aurora was very beautiful.

On July 27, I completed my observation, loaded the outfit in the canoes and started up Peace river, using the motor. We reached Red river, where there is a small settlement, on the 30th, and the same evening camped on the south bank of the river at Vermilion falls. There it was necessary for us to portage our outfit, but, as the water was low, we were able to get within ten feet of the falls and portaged the outfit about 100 feet. Between the falls and the rapids a distance of about a mile and a half, we tracked the canoes singly as the current is very swift, and again portaged the outfit a distance of about 300 feet over the rapids. In these falls and rapids there is a drop of about twenty-five feet. They constitute the only obstruction to navigation on Peace river below Hudson Hope. They could be made the source of a great amount of power, but there is no market for it at present. There is a road extending from Red river to Steamboat landing, a mile west of Vermilion rapids, over which the Hudson's Bay company transport the freight from one steamer to another, and during this season surveys have been made for a proposed tramway on the north side of the river to overcome these falls and rapids.

Near Vermilion rapids on the south side of the river, a few settlers were clearing land at the time of my visit. Above the rapids the current is swift for about a mile, and then slackens considerably. On August 4 we reached Fort Vermilion, where I decided to await the arrival of a steamer which was expected shortly. The vast stretch of level country in this vicinity has great agricultural possibilities, and a visit to Mr. Jones' experimental farm will convince one that all kinds of grain and vegetables can readily be grown and ripened in this section. However, the majority of the settlers are trappers and hunters, and do very little farming. On August 14 there was a slight frost at Fort Vermilion, the first of the season. I left there on the steamer *Peace River* and reached Peace River Crossing on August 19, after having travelled over 1,100 miles by water.

At Peace River Crossing Mr. A. L. Cumming, D.L.S., who was working in the vicinity, furnished me with his packer and four horses, which, together with five others, constituted the pack-train by which I was able to transport my outfit to the location of my next work on the Sixth meridian, near the 23rd base. To reach this place an old trail, which passed near the easterly end of Bear lake, was followed as far as section 10, township 87. We then travelled westerly along section lines to the meridian and northerly on the meridian. The heavy windfall in township 88 necessitated considerable cutting before the line was made passable for the horses. The place of observation was reached on September 5 and I completed my observation on the 18th, the following day from twelve to fourteen inches of snow fell, the weight of which broke many trees, mostly poplar and birch, in the vicinity, and made travelling difficult. I returned to Peace River Crossing for supplies on September 27, and then left for the Sixth meridian near where it crosses Peace river, which was the location of my next work.

I reached the place of observation on October 3, and being favoured with good weather I completed my observation and returned to Peace River Crossing on the 15th.



## APPENDIX No. 43.

## ABSTRACT OF THE REPORT OF J. H. McKNIGHT, D.L.S.

## STADIA SURVEYS IN EASTERN SASKATCHEWAN.

We commenced operations for the season by traversing Big Quill lake in tp. 35-17-2. We found the water in this lake to be very high, and as the land rises gradually from the lake, a slight change in water level greatly alters the shore line. After completing the traverse of the lake in this township, this work was postponed on account of the high water.

Investigations were then carried on in tps. 35 and 36-19-2. and tp. 36-18-2. This district is well settled, and the roads are well graded and in good condition. The crops were very good, although the summer season was hot and very dry.

During July townships 37 and 38, ranges 18 and 19, and townships 36, 37 and part of 38, range 17, were investigated. Through this district the only good roads run north from Englefeld, Watson and Wimmer railway stations, and some difficulty was experienced in finding trails running east and west. The country is partially settled, and there is considerable poplar bush for firewood and building purposes. An abundance of hay grows around the lakes and sloughs, and on the higher land there is a rank growth of peavine and other grasses. These townships are especially adapted for mixed farming.

Townships 36 and 37, range 16, township 36, range 15, and township 35, range 14, were next investigated. The country is covered with large areas of small poplar and willow, and is suitable for mixed farming.

On August 15, I moved camp to Fishing lake in tp. 33-12-2, and also investigated townships 31 and 32. This district is well settled and the farmers are very prosperous. Nearly all have gone in for mixed farming or ranching, especially cattle ranching. Most of the hay for winter feeding is obtained around Foam lake, where there are large areas of splendid hay land, from which hundreds of tons of hay are cut each year. This work was completed on September 8.

We then proceeded to investigate the fractional sec. 7, tp. 33-18-2, going by way of Quill Lake settlement for supplies. This township is gently undulating prairie and is fairly well settled. The crops were below the average owing to the dry season and an early frost. The water in Big Quill lake was still very high and no other traverse was made in the township.

The next work was the investigation of tp. 37-15-2 and part of Ponass lake in tp. 38-14-2. This finished our work in this district.

On September 28 we left to make a traverse of Connell and Harehills creeks, on the west boundary of the Pasquia Forest reserve. From tp. 40-5-2 I followed the summer trail which runs northwesterly through a heavily timbered country and crosses Barrier river on the Kinistino Indian reserve. I then proceeded through a settled country to Arborfield in tp. 47-12-2, by way of Tisdale, a busy town of 350 population. The roads through this district are nearly all graded and in good repair. Prairie and bush fires were burning throughout the country, doing considerable damage, but were checked and stopped by rains commencing on October 2.

From Arborfield I took a winter road, newly cut out, to Connell creek in tp. 48-10-2. Owing to difficulties in making this traverse, and wet weather, this work was not completed, and on October 12 I closed operations for the season.



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## APPENDIX No. 44.

## ABSTRACT OF THE REPORT OF W. A. A. McMASTER, D.L.S.

## RESURVEYS IN THE PRINCE ALBERT DISTRICT.

My first work for the season, which was commenced on July 16, was the resurvey of tp. 46-25-2. This work did not make very rapid progress, as nearly all the monuments were lost or obliterated; it was, however, finally completed on August 24. The Canadian Northern railway runs through sections 32, 33, 28 and 21 of this township, and a ferry crosses Saskatchewan river at the southwest corner of section 22.

After completing this work I left for Sturgeon lake to survey a part of tp. 51-1-3. This lake which is an expansion of Sturgeon river crosses Sturgeon Lake Indian reserve No. 101 which covers the central and southeastern parts of the township. It is a long narrow body of water and is dammed at the east end to store water for driving logs down Sturgeon and Shell rivers. When I was there the sluice was open so that the lake was at its normal level. The rainfall in this district was abundant, as it rained every day except one while I was there.

I next moved to tp. 47-28-2, and after retracing this township I retraced parts of tps. 47 and 48-27-2, the north boundary of tp. 47-26-2 and Prince Albert settlement as far east as river lot 54. I ran trial lines as far as river lot 75 but only temporary monuments were planted.

River lots 55 to 59 inclusive of this settlement form part of the Saskatchewan Penitentiary reserve, and all east of this is occupied by the city of Prince Albert. The surface is generally level or inclined to be rolling. About thirty per cent of the land is covered with poplar and willow, about one-half of which has been killed by fire. The rest is open prairie or has been cleared. The soil is sandy loam, and is well adapted for farming or market gardening. The settlers are engaged in mixed farming and dairying, both of which appear to be a success. Some sloughs, most of which have hay land around them were seen, but no timber grows except poplar up to six inches in diameter, which is fit only for fuel. Saskatchewan river runs along the north of the settlement, and two small creeks flow into it. One crosses the Third meridian about a quarter of a mile south of the base line and runs in a northeasterly direction, the other runs through river lots 15 to 18, also in a northeasterly direction. Each is about ten links wide and has a valley about fifty feet deep. At the time of survey neither was running. There is a descent of about a hundred feet towards the river and the land below is flat and wooded with small poplar and willow, except where it has been cleared. The slopes are generally easy, but where steep they are wooded with poplar, birch and some spruce. The climate was mild and the rainfall sufficient. Jumping deer were noted and also one bear. Of the fur-bearing animals, coyotes, foxes, and muskrats were seen. Ducks, partridges and chickens were plentiful.

About an inch of snow fell on November 6, and on the 12th it came to stay. On that date I ceased operations for the time being, and discharged the party. On February 11, 1915, I commenced the traverse of the river through the settlement beginning at the Third meridian and working east. I completed this traverse on the 15th.



## APPENDIX No. 45.

## ABSTRACT OF THE REPORT OF A. M. NARRAWAY, D.L.S.

## OUTLINE AND BASE LINE SURVEYS EAST OF LAKE WINNIPEG.

My work for the past season consisted of the survey of the north boundary of tp. 20-10-E, and of a continuous line made up of base lines and township outlines from township 48 on the Principal meridian south to tp. 37-3-E.

We left Selkirk on May 16 and proceeded by boat to Little Black river in tp. 21-9-E. We paddled up this river to our first work in tp. 20-10-E.

Little Black river at its mouth is about twenty chains wide and eight feet deep. About a mile from lake Winnipeg the north and south branches join. The former contains about twice as much water as the latter, but both of these branches are navigable for canoes, although in many places fallen trees have blocked the channels.

When this work was completed we travelled by steamer to the mouth of Big Black river, and on June 8 commenced work at the northeast corner of township 48, on the Principal meridian. We surveyed the 13th base line, first west to the lake shore, and then east across range 1, east of the meridian. From there we turned south and surveyed the east boundary of range 1 to the 12th base, and thence east along this line across ranges 2 and 3.

Big Black river varies in width from four to eight chains, and contains very dark soft water, indicating muskeg origin. It is navigable for tugs for about four miles from the mouth. Lake steamers call at this river during the fishing season. This year the water was very low, and the large steamers had some difficulty in passing over some hidden reefs in the channel.

In township 46, Poplar River Indian reserve and Poplar river itself were crossed in sections 36 and 25. There is a strip of good land along the river in this reserve, most of which is still covered by trees, and few gardens were seen. The Indians whose homes are on this reserve spend most of their time during the summer at Big Black river, where a few of them work for the fishing companies.

Poplar river is about three-quarters of a mile wide at its mouth, but narrows upstream to an average of about five chains. There is no perceptible current and not many rapids, making it a very serviceable river for transporting supplies. It is not very deep, and only tugs can enter it. It passes through a large lake lying partly in tp. 44-6-E. This lake is known as Thunder lake, deriving its name from an old Indian legend concerning a high rock ridge a short distance to the south of the lake. From this ridge the country can be seen for miles around. It seems that there are some large boulders piled on this ridge which resemble a huge nest, and it is claimed that young thunder is born there, and that it can be heard echoing and re-echoing among the rocks.

On August 29 we turned off the 12th base line and surveyed the east boundary of range 3 as far as township 37.

In township 44 our line crossed the west edge of Manybays lake. This lake is about three miles long, lying in a southeasterly direction, and drains into Poplar river from its east end by underground connections. There is considerable open floating muskeg around the lake and many rock ridges covered by jackpine and spruce. Many ducks were observed on this lake.

Leaf river which crosses the line in township 41 averages about three chains in width and fifteen feet in depth. It is a very pretty river, and very appropriately



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named. Its mouth during a season of low water on lake Winnipeg, is usually blocked up by a shifting sand-bar, which leaves a channel only about twenty feet wide and a few inches deep. At high water sail boats can enter from the lake. There are a great many rapids up-stream. Some promising stands of spruce and balsam were seen along its banks.

In sections 25 and 24 of township 39 the line crossed Berens River Indian reserve, and in sections 13 and 12 it crossed Berens river. The Indians living on this reserve were found to be a better class of people than those on the Poplar River reserve, and their homes were better looked after. Some good gardens were seen there and also some very good cattle. This year potatoes averaging 100 bushels to the acre were grown on the reserve. Some of the Indians are good packers as they are used to taking hard trips up Berens river with the Hudson's Bay company's freight.

Berens river has a slight current and varies in width from ten to twenty chains. It is very deep and the larger lake-steamers can run a considerable distance up-stream. Several years ago the government had a fish hatchery there, but this has been moved across the lake to Grand Rapids.

The line in township 38 struck lake Winnipeg in section 25, and crossed Pigeon bay, a distance of about four and a quarter miles. This was passed by means of a triangle.

Pigeon river which empties into this bay is much the largest river crossed by our lines this season, and if a lake-steamer could enter its mouth it is probable that it could run about ten miles up-stream. The mouth of this river is very narrow, being partly blocked by a shifting sand-bar, and no boat larger than a skiff can enter at low water, or a sailboat at high water.

On October 14 having reached the northeast corner of tp. 37-3-E, I closed operations and returned to the mouth of Berens river. From there we travelled by steamer to Selkirk where we arrived on the 21st.

The country covered by our surveys is usually level and is made up of a succession of swamps, muskegs and low rock ridges. As a rule these swamps are covered with a growth of stunted spruce and tamarack, and there is usually standing water on the surface. The muskegs are generally not very deep, and have a clay bottom with more or less muck. There is also a lot of deep moss muskeg which is dry and springy. The growth on this muskeg is generally scattered small spruce.

In some places where the lake cuts the edges of such a muskeg, moss seven feet deep was seen. The rock ridges are usually granite outcroppings often covered with a thin growth of spruce and jackpine.

The rivers entering the lake on the east side are very similar and have little current except at the rapids. In several places Big Black river widens out to nearly twenty chains and then narrows to about six feet, while Leaf river has rapids that can be crossed by a short step. The rivers usually are a succession of basins and short rapids.

Lake Winnipeg is known throughout America for its whitefish and sturgeon, and it was therefore interesting to see the actual fishing operations carried on. This year no sturgeon fishing was carried on owing to close season, but two companies were engaged in fishing for whitefish and pickerel. These companies have fishing stations at Big and Little George's island, Little Sandy islands, Big Black river and Warren's landing. At Big Black river and Warren's landing tugs as well as sailboats are used for fishing. Each company operates a freight and passenger steamer to collect its fish and bring them to Selkirk. These steamers aim at making two trips a week during fishing season which lasts from June 1 to August 15. After this date the Northern Fish company's steamer made one trip a week, carrying passengers. This steamer also calls at Berens river when it has any freight for that locality. During the fall pickerel fishing is carried on from skiffs, the catch being shipped to Selkirk in tugs.



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and in the winter whitefish are taken through holes in the ice. Many whitefish are cached in the fall by the Indians for dog feed during the winter.

While moose and deer are none too plentiful on the east side of the lake, yet there are enough to furnish food for the Indians in that district. There seems to be a fair number of fur-bearing animals in this district, including many black and silver foxes. While we were running the 6th base line during May, one of my men was fortunate enough to catch alive two black foxes, for which he received \$800.

Throughout the months of July, August and September, numerous forest fires crossed the district in which we were working. In some cases patches of good timber were burned. There are still some promising stands of timber which would be well worth saving, and as it is usually to be found along the rivers, which are well adapted for quick and easy travelling, it could be easily patrolled by firerangers.





Photo by J. A. FLETCHER, D.L.S.

#### RAFTING ON WABISKAW RIVER.

A raft constructed of dry logs held in place by cross pieces firmly lashed in position with cinch ropes, is useful over smooth stretches of river. This raft was large enough to carry the cook outfit and some 1,200 lbs. of provisions; it was floated down the Wabiskaw river from Tall Cree's place to the 27th base line. The men on the raft are carrying long poles for steering.



Photo by J. A. FLETCHER, D.L.S.

#### SWIMMING HORSES ACROSS WABISKAW RIVER.

As no horse feed grew on this side of the river the horses had to be taken to the other side. The men in the canoe are leading one horse and the others are crowded in with a rope.







## APPENDIX No. 46.

## ABSTRACT OF THE REPORT OF R. NEELANDS, D.L.S.

## STADIA SURVEYS IN CENTRAL SASKATCHEWAN.

My season's work consisted principally of the investigation of water areas and the stadia survey of permanent bodies of water in a block of townships about three ranges wide and extending about sixty miles south from Prince Albert. Over thirty townships were examined and all are somewhat similar in character. The surface is rolling and often hilly, covered in places with poplar and scrub and containing many small lakes and sloughs.

In many of these townships the road allowances are not opened up, and in only a few are the roads graded, as the homesteading is recent and some land is still vacant. A great many settlers are Ruthenians and French Canadians, nearly all of whom are engaged in stock raising and mixed farming.

Many of the lakes are alkaline but a few contain fresh water. Muskiki lake, which occupies a large part of the southwest portion of tp. 39-26-2, is saturated with salts, and in dry seasons is nearly viscid. The water is said to be beneficial in treating rheumatism, and the water of Muskiki springs, which are situated on the southeast side of the lake and which form its chief supply, are said to have valuable curative properties. Having finished the work in this block of townships, I left for tp. 44-22-2. The greater part of this township is included in the low area surrounding Waterhen lake and is an extension of Waterhen marsh. Few of the road allowances are opened up, but there is a graded road from Meskanaw, in the southern part of the township, to Kinistino, on the Canadian Northern railway.

On October 12, I moved to tp. 53-7-3, and on completing the work there returned to Prince Albert, where I discharged the party.

In general this whole district is rolling country, mostly covered with small poplar and scrub, and broken with many ponds and lakes. It is drained by Saskatchewan and Carrot rivers. Hay, wood and water are abundant, and it is fairly well provided with roads and railways. It is first-class agricultural land, and farming is the only industry engaged in by the settlers. About seventy per cent of the land is settled by various European nationalities, who seem contented and prosperous.

Although the season was unusually dry and favourable for stadia surveys, few sloughs were completely dry, and only two section lines were retraced and one monument erected. Three hundred and twelve lakes, ninety-nine islands and a part of Saskatchewan river were traversed. Many sloughs and marshes were also investigated.



## APPENDIX No. 47.

## ABSTRACT OF THE REPORT OF W. H. NORRISH, D.L.S.

## SURVEYS IN THE VICINITY OF LYTTON, BRITISH COLUMBIA.

Early in April, 1914, I was appointed as assistant to the late Mr. A. E. Hunter, D.L.S., and upon his death, on July 14, was placed in charge of the party.

The season's work was begun in tp. 11-26-6, where, after completing the necessary subdivision, ties were made to the Canadian Northern railway, which is now constructed from the coast to the bridge across Fraser river, six miles south of Lytton. Part of the left bank of the river was also traversed. Our work was nearly all on the east side of the river, but connections had frequently to be made to posts on the opposite side, necessitating triangulation.

There are four small Indian reserves on the left bank of Fraser river, in this township, and although the benches on which they are situated are small, the land, if properly tilled, would be exceedingly productive, as it has been demonstrated that almost anything can be grown there. Great success is attained with garden produce, including all sorts of small fruits. There are several homesteaders in this township, but most of them are on the opposite side of Fraser river, where the hills do not rise so steeply and where there is considerably more farming land along the river. Some of the settlers are starting orchards which promise fine results. The hardier fruits, such as apples, pears, plums, etc., are practically sure to be a success.

Transportation routes are limited. On the west side of the river a good wagon road runs from North Bend to a ranch about half a mile north of Chaumox siding on the Canadian Pacific railway. On the east, or left bank, the Yale-Cariboo road forms the route for transportation. Although cut up in places by the grading of the Canadian Northern railway, this road is passable through the greater portion of the township. The bridge over Stoyoma creek in section 2 has disappeared and the road has been spoiled by the railway construction south of there.

Our next move was to tp. 12-26-6, where we completed the subdivision surveys necessary to tie in the Canadian Northern railway, and to dispose of the lands recommended for survey, as well as considerable retracement work to define the boundaries of Boóthroyd Indian reserves Nos. 5 and 6, and lot 3, G.I.C.G. We also traversed the left bank of Fraser river through the township, where not already done.

The soil is rich, sandy loam on the benches and hollows, and is exceedingly productive, but it should be irrigated to ensure the best results, as the summers are inclined to be dry. It is regrettable, also, that the country is so thickly wooded that an enormous amount of work is required to clear the land, while the timber is poor in quality.

On July 9, we moved northward and across Fraser river to the village of Keefers from where we made the necessary surveys on the west side of the river in township 12, range 26, and began the traverse of the right bank of Fraser river through townships 13, ranges 26 and 27. It was while running the north boundary of section 5 in tp. 12-26-6 that Mr. Hunter slipped over an embankment and was drowned in the rapids on Nahatlatch river. His body was not recovered until eight days later, when it was forwarded to Wiarton, Ont., for burial.

I was then placed in charge of the party and on July 24 again commenced the traverse of the right bank of Fraser river, in township 13, range 27. We finished this work on August 1, and on the 3rd moved camp to Dot station in the Nicola valley.



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to commence the second part of the season's work, consisting of surveys in tps. 13, 14 and 15-23-6, and tps. 15 and 16-24-6.

From this camp we made subdivision and retracement surveys in the northern part of township 14 and the southern part of township 15, range 23. In township 14 we completed the survey of the quarter sections adjoining the east boundary of Lower Nicola Indian reserve No. 10, and retraced the east boundary and part of the west boundary of the reserve. We also ran the 4th correction line from the NE cor. sec. 33, tp. 14-23-6, westerly to the SW. cor. tp. 15-23-6. We then subdivided the good lands in the southwest portion of township 15 lying west of Nicola river as well as sections 3 and 10 east of the river. The river was traversed where not already done and part of the east boundary of Lower Nicola Indian reserve No. 11 was retraced. Altogether, the work covered from this camp totalled nearly forty miles.

The country covered was mostly rough timbered hills, but benches of good agricultural land were found on some of these hills. The Nicola valley is very narrow, but what lands there are at the bottom of the valley are very good. The climate is very dry as this district is in the midst of the dry belt, and it is almost imperative that the land be irrigated. This season was exceptionally dry, and most of the streams which usually carried considerable water in the middle of the summer were practically dry.

The timber is mostly fir and pine frequently running up to thirty inches in diameter, and in some places considerably larger. Scrub, poplar, etc., are not as thick as along the Fraser, although we noticed occasional poplar swamps which contain good agricultural lands.

On October 2 we moved from Dot to tp. 13-23-6 and camped near lot 779, about four miles from Canford post office. In this township the subdivision of sections 27 and 28 was completed and some subdivision done in the southwest portion of tp. 14-23-6. We also retraced another portion of the western boundary of Lower Nicola Indian reserve No. 10.

On October 21 having completed the above-mentioned surveys, we went to Claperton which is the first station south of Spence's Bridge, on the Nicola Valley branch of the Canadian Pacific railway, and surveyed parts of sections 3, 10, 15 and 16 in tp. 16-24-6.

Practically all of this township seems to be suitable for grazing purposes as the hills seem to bear a fair crop of bunch grass. A high plateau is to be found on the west side of Nicola river, which contains particularly good grazing lands. The hills on the east side of the river, though rising quite steeply for several hundred feet from the river, have afterwards very moderate slopes and are covered with an abundant growth of bunch grass.

The timber is practically all pine and fir, with pine predominating. It is a scrubby variety though growing to a fair size.

We traversed both the right and left banks of Nicola river through the southern half of the township, and also did some retracement of Indian reserves.

I closed operations on November 3.

The weather on the whole could hardly have been better. It was exceptionally dry during the summer although excessively hot at times. Most of the rain fell after September 10 when it began to rain rather frequently.



## APPENDIX No. 48.

## ABSTRACT OF THE REPORT OF P. E. PALMER, D.L.S.

## SUBDIVISION SURVEYS IN NORTHERN MANITOBA.

After organizing my party at Pas, we left on July 4, 1914, by the Hudson Bay railway for tp. 63-13-Pr., where our first work was located.

In this locality subdivision was done in fourteen townships along the railway right of way from township 65, range 13, to township 70, range 7. The work was completed on January 30, 1915. I then returned to Pas and surveyed a small island in tp. 56-26-Pr., after which I closed operations for the season.

Pas is the distributing point for supplies to a large section of northern Manitoba and Saskatchewan. It has a large lumber and fish trade and is also a fur-trading centre. Should the newly discovered mineral areas around Beaver and Wekusko lakes prove valuable, Pas will also be a mining centre. Its present population is about 1,500. Two lines of steamers which ply on Saskatchewan river, furnish the chief connections with the trading posts.

In its general character the country covered by my surveys is but little suited for agriculture, though parts of it could, no doubt, be used at the present time. In this connection it is worthy of note that I saw wheat, barley and oats growing around an old railway construction cache, in tp. 69-7-Pr. The straw was exceptionally long and strong and the grain was well-ripened and not hurt by frost on October 5. I was informed that in 1914 frost came much earlier to the settled parts of Saskatchewan and Manitoba than it did in the country where I was working.

The deposits of peat and muck in the swamps and muskegs in this country are not so deep as those in similar areas farther south. As a rule, this soil is from six to thirty-six inches in depth, and if the country were drained, I see no reason why this land could not easily be brought into a high state of cultivation. There is but little timber in the country covered by my surveys, and that mostly confined to the shores of lakes and banks of creeks where there is drainage. The small spruce and tamarack growing in the swamps and muskegs does not attain sufficient size to be of value, but dies when it reaches a diameter of eight or ten inches. A scourge of green caterpillars visited this locality in August and completely denuded the tamarack of their leaves. This will probably have the effect of killing most of them.

Game is far from plentiful in this country; a few signs of moose, caribou and bear were observed, but only two moose were seen during the entire season. There are a few partridges, pinnated grouse, and ptarmigan, but no great number. Rabbits, however, are abundant, and foxes, mink and muskrats are fairly plentiful, while lynx, otter and marten are more rarely found. Several fine specimens of the black and silver grey fox were captured in this neighbourhood during the early winter. In this connection I would like to call attention to the practice of many trappers in putting out poison for foxes and other fur-bearers. Though this act is illegal, it is done to a large extent by trappers, especially foreigners, who have not the skill to capture their game in other ways. Much of the game so killed is never found, as it is covered by the drifting snow, or else, if found, the pelt is too often destroyed by ravens or mice. In view of our rapidly decreasing supply of fur it would appear that steps should be taken to stop this practice, and to prohibit the sale of strychnine and arsenic for this purpose.



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The numerous lakes in this district are nearly all well stocked with whitefish, jackfish, and mullet, and in Pakwa and Setting lakes pickerel are also taken. Several carloads of fish were shipped from Setting lake this winter as well as one from Kiski lake. A small net supplied enough fish for the requirements of my party during a large part of the season.

No trace of minerals was observed during the course of the survey, but the magnetic needle showed a difference in variation of nearly ten degrees between different observation points occupied during the season. A difference in variation of five degrees was observed in one instance where only one mile intervened between the observation points, which would indicate the presence of iron ore in large quantities. These irregularities were noticed to a greater or less extent at all points in my work. East of range 11, ridges of granite occur at frequent intervals. Some small veins of quartz were noticed at various places in these ridges, but no signs of gold were visible. The granite in this locality is said by the engineers of the Hudson Bay railway to be the hardest rock encountered in any part of Canada.

The snowfall in this district was quite heavy, there being about eighteen inches at the time of closing operations. It was noticed that the snow became deeper as one went north, and this I am told is the general rule in this part of the country.



## APPENDIX No. 49.

## ABSTRACT OF THE REPORT OF R. C. PURSER, D.L.S.

## MISCELLANEOUS RESURVEYS IN MANITOBA AND SASKATCHEWAN.

The scattered miscellaneous surveys on which I was engaged during the season of 1914 were mostly in settled districts. The party consisted of myself and one assistant, local help being procured where necessary.

During the season about thirty surveys and investigations were made, the length of time necessary to complete any one survey varying from a few days to three weeks according to its nature. For the most part this work lay in the southern part of the provinces of Manitoba and Saskatchewan, the greater part being in the latter province.

The season throughout was very favourable to our work, but was unfavourable to the farmers in many of the districts, the crops suffering heavily on account of the exceptionally dry summer that prevailed.

A considerable part of our work consisted of the establishing of section and quarter-section monuments in places formerly covered with water but now dry. This work is of considerable benefit to the settlers as it permanently and officially establishes for them corners which might otherwise be in dispute and subject to arbitrary determination by the parties themselves.

In some cases whole lakes of considerable size had dried up since the original survey and in these the section lines were run and the corners perpetuated by monuments. One of these was Whitebear lake lying in tp. 24-15-3 and extending into the surrounding townships. This lake bed was yielding large supplies of wild hay at the time of the survey and already part of it was being made ready for cultivation.

Another class of work of equal importance with the above was resurveys for the purpose of locating corners, the original monuments for which were either lost or not in the position where they should have been according to the official plans of the township. In order to make any correction in these cases it was necessary to conform to section 57 of the Dominion Land Surveys Act which requires the written consent of the owners affected by the alteration. In some cases where this could not be obtained, nothing could be done towards a correction of the existing errors and retracements only were made for the purpose of putting the correct chainages and bearings upon the official plans.

Other work of various natures was undertaken consisting of retracements, investigations and correction surveys of different kinds. Magnetic observations were also taken, both for magnetic dip and total force, in every place where it was possible to do so without interfering with the regular work. My season's work in the field extended from June 1 until the end of December.



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## APPENDIX No. 50.

## ABSTRACT OF THE REPORT OF C. RINFRET, D.L.S.

## STADIA SURVEYS IN SOUTHERN SASKATCHEWAN.

During the past season my work consisted of stadia surveys in thirty townships south of Moosejaw, and mostly along the Weyburn-Lethbridge branch of the Canadian Pacific railway.

The district was, in general, well settled, very few homesteads being vacant, and the roads are all in good condition.

The surface is mostly level, though rolling in places, and the soil is well adapted to mixed farming. Water seems scarce in some localities. There was a fair rainfall in townships 9, ranges 21 and 22, but elsewhere it was not sufficient. The district seems well suited for ranching where water for the stock is available.

The district north of Twelvemile lake, just west of the Third meridian, with the exception of a strip about a mile in width along the water, which is cut up by coulees, is rolling and suitable for farming. It is well settled. The southern part is rather hilly, and ranching is more successful; it is yet only sparsely settled, and a number of good homesteads are available.

My last work was in tps. 12 and 13-27-2. These townships are hilly and have many small lakes and sloughs. Ranching is carried on there to a small extent.

Although this district had much less rain this year than usual, 268 lakes and sloughs were found and traversed; the most of them are small, not over three feet deep and had potable water. Generally as soon as the land surrounding these lakes is cultivated the lake beds rapidly decrease in area. Sixty-six section corners previously under water were found dry, and the necessary section lines were run, and the monuments erected.

The crop was poor this year on account of the lack of rain, and what did grow was considerably damaged by a heavy frost early in August.



## APPENDIX No. 51.

## ABSTRACT OF THE REPORT OF O. B. ROBERTS, D.L.S.

## STADIA SURVEYS IN CENTRAL ALBERTA.

On June 1 we commenced our season's operations in tp. 42-9-4. Our work was at first retarded owing to heavy rains and the flooded state of Battle river, which rose eight feet above its normal height, and this flooding together with the heavy growth of bush and undergrowth along the river banks forced me to postpone its traverse through the various townships in which I worked, until a more favourable opportunity should present itself. I decided to wait until the work could be done on the ice, but as I closed operations before that time it was left undone.

The territory in which I worked may, for convenience of description, be divided into groups.

The first group comprises all the territory from townships 39 to 42 inclusive in ranges 9 and 10, west of the Fourth meridian.

This district is very rolling with numerous bluffs of poplar scrub. It becomes gradually less rolling towards the south, until in township 39 the surface is gently undulating. There are numerous sloughs in this block, which produce unlimited quantities of hay.

The soil in township 42 is very sandy and accordingly is not well adapted to farming. Under the most favourable conditions the crops are very light. Farther south the soil becomes heavier, and in township 39 it is too heavy for such low-lying country. Here the crops are very late, and in most cases become frozen before they are ready to be harvested. As a result of these different drawbacks, there is not very much of this block under cultivation. In the southern part of the block, oats is the predominating crop. Barley ranks next, while very little wheat is grown. The oat crop is, in many cases, harvested while yet green, and used as winter fodder for the cattle and horses, the raising of which is the chief industry, as the grazing facilities in this district are unequalled anywhere. The raising of hogs is also an important branch of agriculture.

The railway facilities of this district are about as good now as they are likely to be for many years, except, perhaps in township 39, where the new Canadian Pacific railway branch line from Coronation northwesterly is under construction. This line has been under construction for a number of years and in the opinion of the settlers it is not likely to be completed for some time.

A branch of the Canadian Pacific railway passes through township 42 in this group and at the present time is the only outlet from these parts.

The valley of Battle river is so wide here and so hilly that wagon transportation is quite difficult. The roads are fair and are kept in good repair, although very rolling as is natural from the rolling condition of the country. Two steel bridges span Battle river in this district, one near Hardisty and the other in township 41. From these bridges trails strike out in many directions, following in all cases the lines of least resistance. This plan is greatly simplified by the almost entire absence of fences. There are also very fair trails on either side of Battle river running throughout the district, and giving an excellent outlet from the interior parts of the district to the town of Hardisty.

With the exception of tp. 39-9-4 Battle river traverses all the townships in this district. This stream is very winding and muddy. It is from one and one-half



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to four chains wide, and has a current of from one and one-half miles at low water to about five miles per hour at flood. Its valley is very deep, rugged and wide, especially on the east bank where broken country extends eastward for two or three miles. This valley is from 250 to 300 feet deep, and at the bottom of the valley especially near the river bed are many muskegs and marshes which are very dangerous to stock. There are also many quicksand beds along the shore, which are extremely dangerous.

The problem of water supply is an easy one. The average depth of wells is from ten to twenty feet, and the numerous sloughs and lakes make it unnecessary to dig wells for watering the stock.

Generally speaking this block is best suited for stock raising and dairying, but enough grain can be grown to supply local requirements.

The second group comprises all those townships adjoining the north bank of Battle river and northward to the north boundary of township 42, and from ranges 11 to 17 inclusive.

The surface of this area, apart from the river valley is gently rolling prairie. The river valley here is quite narrow and seems to break off abruptly into a prairie country. There is not the same gradual change from very rolling to level prairie as there is in the former area. Township 41, range 16 and township 42, range 17 are, however, cut up by large coulées.

The soil is a clay loam, very well suited for grain growing, and splendid crops were seen. The townships in ranges 11 and 12 are seemingly the most prosperous in this district. This is partly due to the fact that the Canadian Pacific railway has settlements here, on its improved farms. The greater part of the district is under cultivation, the principal crops being wheat and oats. Considerable barley is also grown for hogs, the raising of which is an important branch of farming. The growing of wheat, however, is the predominant feature. Dairying is also carried on to a limited extent.

The different municipalities have constructed excellent trunk roads from Battle river to the important towns on the railway. These roads are kept in excellent condition. The various roads in the interior of the group, although not as well kept, are still quite passable. They all lead by the most direct route possible into the trunk roads. Practically all the road allowances have been opened, and in several cases the "blind lines" have also been opened up to give better transportation facilities to the settlers.

The rural telephone is used extensively throughout the district.

Battle river, already described, flows through the southern part of this district. Across it are two steel bridges, one near Cranmer in tp. 39-12-4, and the other near Loveland in tp. 40-14-4. Fords are also found at various places.

The lakes in this district are very limited in number, the most important one being Goose lake in township 42, range 11. There are many sloughs, however, which produce excellent hay and pasturage.

Numerous coal mines are also found along Battle river. Probably the most important are in township 40, range 14. Here there is at least one in operation the year round. They supply the surrounding country with cheap fuel.

In general this group is a grain-growing district. It is well settled and on the whole quite prosperous. Stock-raising, except the raising of hogs, is not taken up, except as a secondary consideration. Wheat and oats are the important crops.

The third group comprises all those townships adjoining the Lacombe branch of the Canadian Pacific railway from ranges 14 to 17 inclusive, together with tp. 39-19-4.

The surface of this area is gently rolling prairie with scattered bluffs of poplar and with some low-lying land. Townships 37 and 38, range 14, are broken to some extent by the valley of Castor creek. Townships 38 in ranges 16 and 17 are also slightly broken up by the valley of Bigknife creek. Apart from these two valleys the country is gently rolling prairie.



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Redwillow creek flows northwesterly through tp. 39-19-4, but the banks are indefinite, and as a result the surrounding country is liable to overflow during flood seasons. Excellent grazing and hay lands lie along this stream.

The soil is a heavy clay loam, and is not well suited to the growing of wheat, as the harvesting is so prolonged that frost is liable to injure the grain. Oats is the principal grain grown in this district. Barley is also grown to a considerable extent and is used as feed for hogs, the raising of which is an important industry. Dairying is carried on extensively, the products being shipped by rail to the Edmonton market. Several people in this district have been extensively engaged in horse raising, and from all accounts they appear to be making a success of it.

The roads in this district are in a fair condition and considerable grading has been done.

Lanes lake is the only body of water of any size in this district. This lake has dried up considerably since the original survey, especially at the ends. The bed consists of about two feet of black loam, and when worked it will produce an excellent crop. Some parts of it are now under cultivation.

Several small lakes and sloughs are scattered throughout this district, affording water for stock. In cases where sloughs have become dry they produce excellent hay. Water for domestic purposes is easily obtained at a depth of about thirty feet.

In general this group is a mixed farming country. It is well settled and quite prosperous.

Besides these three groups, a number of scattered townships lying to the south and east were investigated. Most of them suffered severely from the extreme heat and drought of the season and crops were very light.

During the season I retraced 204 miles of line and re-established the same number of monuments. The total number of monuments investigated by me exceeded 2,500.

I closed field operations on October 15.



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## APPENDIX No. 52.

## ABSTRACT OF THE REPORT OF B. H. SEGRE, D.L.S.

## STADIA SURVEYS IN THE VICINITY OF MOOSEJAW.

The area covered by my investigations during the past season may, for convenience of description, be divided into four groups.

The first group comprises townships 18 to 20 inclusive, between the east boundary of ranges 23, west of the Second meridian and Buffalo Pound lake.

The surface of this district consists of rolling prairie, which becomes rougher and more broken as the valley of Buffalo Pound lake is approached. The soil for the most part consists of a good loam, more or less freely intermixed with granite boulders. All those townships north of the valley of Qu'Appelle river are capable of producing excellent crops, but the district is not well settled for the reasons that the lands near the railway are held by speculators, and that the farmers near the lake, owing to the long hauls over the poor roads, do not find grain growing to be very remunerative, and hence go in for a larger amount of stock raising.

An adequate supply of good water is obtained by the farmers of this district at depths varying from six to twenty feet, which is quite an asset. With a railroad nearer Buffalo Pound lake or an improvement of the roads this district should soon become thickly populated.

There has been very little grading done in this district, especially away from the railroads. Many hillocks need cutting down and many low places need filling, and until these improvements are made, farmers who are far away from the railroad towns find their transportation problem a serious one. There are a few crossings on Qu'Appelle river which are bridged, but the grades leading to them are in many instances excessive.

Telephones are rather scarce in this district, but during the summer a few new lines were being erected which should prove of great value to the settlers.

The southern part of the district is cut up by Qu'Appelle valley, which is about a mile wide and from 250 to 300 feet deep. The northern slopes of this valley consist chiefly of prairie with a few shrubs in the coulees, but the southern slopes are covered by a growth of poplar, ash, and willow; the flats adjoining the banks of the river provide excellent pasture for stock, and in some places are being used for growing grain. The light snowfall in this locality, along with the shelter provided by the wooded slopes of the valley, make ranching attractive. The light snowfall of the previous winter and the dry summer has lowered Buffalo Pound lake about two feet, and at the same time has affected the flow of both Moosejaw creek and Qu'Appelle river. Numerous sloughs in these townships are dried up, and were this year producing hay, a fact which was greatly appreciated by the farmers, owing to the failure of the oat crop in this district.

The second group comprises townships 17 to 20 inclusive, and between the first group and the Third meridian.

The surface of this district varies from gently undulating prairie on the eastern boundary to gently rolling prairie on the western boundary, while the southern boundary is cut up by the valley of Thunder creek, which is a tributary of Moosejaw creek. The soil is a light sandy loam in the eastern portion, becoming a little heavier in townships 19 and 20, ranges 28 and 29. The soil along the slopes of Thunder creek is sandy, but gets a little heavier to the south of the valley, with the surface becoming very much broken up.



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All the lands in this block are used for grain-growing purposes, except along the slopes of Thunder creek valley, where the farming operations are confined to stock raising only. A good growth of grass thrives along these slopes and the river flats, while the shrubs and poplar bluffs provide the necessary shelter from cold and wet. The water supply, however, is uncertain, as at the time of investigation the creek was dry in places, and the stock were becoming dependent on the supply from wells.

The country north of the valley produces excellent crops, but the farmers have great difficulty in procuring an adequate supply of water. A few wells 200 feet in depth have been sunk, and an abundant supply has been obtained, but the water is generally of an inferior quality. This shortage of water is keenly felt by the smaller farmers who cannot afford the expense of sinking deep wells, and consequently have to spend a great deal of their time in carrying water from the many Government ponds scattered throughout the district.

This district is well supplied with railway facilities as the main line of the Canadian Pacific runs along the southern boundary, and two branch lines of the Canadian Pacific and the Grand Trunk Pacific run northwesterly through the district. A daily passenger and freight service is maintained by the Canadian Pacific, whereas on the Grand Trunk Pacific the service is confined largely to freight, owing to the line being completed only a short time ago. This new line supplies a long felt need to many farmers who found the haul to the Canadian Pacific very long.

The roads in this district are nearly all graded, and generally are in very good condition. In places where the soil is light, however, the wind drifts it over the roads, making them very heavy for traffic, especially after rainfall.

This district is well supplied with telephone facilities, nearly every farmer having a telephone in his house, and extensions are being carried on every year.

The towns along the railroads in this district are all small, except Moosejaw, which extends into township 17, range 26. This city is a thriving divisional point, being served by three railways, with many branch lines running out of it. There are many industries in this city, the largest being the Robin Hood flour mills, which employs a large staff. The city has lately completed its new water-works system, which has proved the solution of a vexatious problem.

The supply is obtained by placing filtration galleries along Sandy creek in township 17, range 29, and then conducting the water by a pipe line a distance of twenty miles to the city.

This district is undergoing a great change in its water areas; all small sloughs are completely dry, and their beds are being used as pasture land. Pelican lake, which lies in the valley of Thunder creek, is completely dry, and now constitutes the largest dry lake bed in this district. Another lake which formerly covered about 200 acres in tp. 18-28-2 has dried up, and the bed is being used for grazing purposes. All that portion of Thunder creek lying to the north of Pelican lake is now dry, but below Pelican lake water lies in pools along the course of the creek. Sandy creek, the tributary of Thunder creek, which is the source of supply for the city of Moosejaw, has many springs along its course, and hence always contains water. There is a small lake in tp. 17-29-2 which was traversed; this lake is evidently permanent as the Canadian Pacific Railway company formerly had a water tank and pumping station on it.

The third group consists of townships 17, 18, 19 and 20, range 1, townships 19, ranges 4 and 7, and townships 20, ranges 2, 3, 4, 5 and 7, all west of the Third meridian.

The surface in this district consists of gently rolling prairie in range 1, becoming rougher as one travels west, finally becoming very rough and hilly around townships 19 and 20, range 7, where the Vermilion hills occur. The surface of the country adjoining the valley of Thunder creek is also very rough, the valley itself being about



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150 feet deep in some places, with slopes nearly perpendicular, thus making good road crossing very hard to find.

The soil of this district varies from a light loam on the east side, to a good loam on the west. This loam is always found to be freely intermixed with granite boulders; these boulders became larger and more numerous immediately adjoining the valley of Thunder creek.

This district is well settled but owing to two consecutive dry seasons, there was almost a complete failure of crops this year. This seeming disadvantage can be overcome in any normal year, as the soil is very fertile and easily worked. Settlement is not very thick in tp. 20-7-3 owing to the hilly nature of the country, numerous deep ravines with precipitous sides being found. These hills would make an ideal place for ranching, if the problem of water supply could be overcome. Here, as in the district to the east, the farmers find some difficulty in obtaining a sufficient supply for all their needs from the shallow wells they are able to dig. There is no doubt however that the past season was a most severe test on wells owing to the dry weather lasting for two years. In ordinary years the settlers of this district should have no difficulty with their water supply.

The coming into this district of the branch line of the Grand Trunk Pacific railway has supplied a long felt want, effecting a great saving to the farmers who hitherto have had to haul their grain about twenty-five miles to the Outlook branch of the Canadian Pacific railway. Many little towns are springing up along this line, but as yet no industries have been undertaken in any of them.

The roads in this district are mostly graded, but in a few cases they are in poor shape; especially is this true in tp. 20-7-3, where the road allowances offer very poor routes for travelling. The old trails are being fenced as quickly as the district becomes settled, causing a great deal of inconvenience to those farmers who have been in the habit of using them. A good crossing of the valley of Thunder creek is badly needed for those people who live on the south side of the valley in township 19, range 4, and west of it.

Telephone communication is very poor in this district due no doubt to the fact that it has been lately settled; however, the nearer the farmers are to the railroads, the better the telephone facilities.

All small sloughs in this district are now dry and produce hay, especially in the case of tp. 20-7-3. This township contains a large number of sloughs, which are now completely dry. This fact has been made good use of by the settlers, who have put up an abundant supply of hay, thus partially offsetting the failure of their oat crop, and rendering the problem of feed for their stock a little easier. The valley of Thunder creek runs through this district; the creek itself was dry, and many lakes lying in the valley have dried up. The largest noted being a lake in tp. 19-4-3.

The fourth group comprises a block of townships lying immediately north of the third group.

The surface in this district is cut up on the west by the valley of South Saskatchewan river; the valley at this point is about 300 feet deep, and over a mile wide. Above the valley the surface varies from gently undulating prairie to gently rolling prairie, until range 3 is reached, after which the country becomes rougher especially to the north, until the sand-hills which adjoin the valley of Qu'Appelle river are reached. Here the surface becomes very rough and cut up by many deep ravines.

The soil on the slopes of South Saskatchewan river becomes lighter as one approaches the shores, and in tp. 22-7-3 there are a number of bare sand hills with no trace of vegetation growing on them. Above the valley, the soil consists of a good loam which produces excellent crops in ordinary years, but the effects of two abnormally dry years were felt in the shrinkage of the crop yield.



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Along the banks of the South Saskatchewan there is a good growth of poplar and willow, and in secs. 29 and 32, tp. 22-7-3 the poplar reaches nearly thirty-six inches in circumference, however, these large trees are being cut for fuel, and will disappear in time. Above the valley the surface consists of prairie until the valley of Qu'Appelle river is reached where poplar and willow are again found. The sand-hills north of the Qu'Appelle have been placed in the Elbow Forest reserve and are covered by a dense growth of willow and poplar.

This district is very thickly settled from the eastern to the western boundaries, and as one approaches the Outlook branch of the Canadian Pacific railway the improvement in the buildings of the farmers is very noticeable and indicates the prosperity of previous years. All the lands are used for grain growing, and have produced good crops until this year, when the yield has fallen.

The railroad facilities of this district are very good, two branch lines of the Canadian Pacific and Grand Trunk Pacific railways serving the territory. To the north along the valley of the Qu'Appelle there is a location line of the Canadian Northern railway; this line when constructed will be of great benefit to the settlers on the north side of the valley, by saving them the extra haul across the valley to the Canadian Pacific.

The roads in this district are for the most part graded, and a little improvement is being undertaken every year tending to produce good roads a few years hence. There is a fair trail down a ravine in tp. 22-7-3 leading to a ferry across the river; this trail can be greatly improved by the building of a grade and proper draining of the road bed. The grade across the Qu'Appelle valley in tp. 23-2-3 was travelled over after a heavy rain, and was found to be in very poor condition; this could be easily remedied by the use of some gravel an abundant supply of which can be obtained along the slopes of the valley.

Telephone facilities are on the whole very good in this district and additions are being made every season tending to the betterment of the service.

The drying up of sloughs is very evident in this district; all small sloughs were found to be completely dry, and were being used for hay purposes. One lake of fair size was traversed in tp. 22-3-3; this lake at the time of traversing had its bed covered by a coat of white alkaline mud too soft to bear the weight of a man; however, after a rainy period the whole bed became covered by water. There is no vegetation on the bed of this lake, and the land is quite useless for farming purposes.

The lake in tp. 22-7-3 was found to be dry at the time of investigation; the bed of this lake was covered by a thick growth of marsh grass around the shores and by a thick growth of reeds in the centre; there is no doubt that the reedy portion of the bed will be covered by water in wet years, as it is the natural basin for receiving the drainage of a large area.

Ridge creek, which is a tributary of the Qu'Appelle, drains a large area in this district; no water was found along its course until the valley of the Qu'Appelle was approached. Qu'Appelle river was found to contain water, but was very much lower than usual.

After completing the investigation of this district, I left on October 12 to investigate tp. 28-1-3, for which I had special instructions. Silver lake in this township was found to be dry, and in spite of recent heavy rains the former bed was able to bear the weight of a man; hence it is very likely that it will remain permanently dry.

I closed operations in the field on October 15.



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## APPENDIX No. 53.

## ABSTRACT OF THE REPORT OF F. V. SEIBERT, D.L.S.

## SURVEY OF THE 26TH BASE LINE BETWEEN THE FOURTH AND FIFTH MERIDIANS.

When making plans for the survey of the 26th base line, I decided to commence at its intersection with the Fourth meridian. The route which I proposed to follow to reach this point was by scows down Athabaska river to the vicinity of the base line and from there overland to our destination. Accordingly, on May 1 I left Athabaska with my party and outfit on four scows, arriving at McMurray on the 13th. At this point we were met by the pack ponies which had been sent down the river on the ice. The ponies were loaded on the scows and after experiencing considerable difficulty at the various rapids on account of low water, we reached the mouth of Redclay creek in the vicinity of the line on May 16.

A cache was built on the west bank of the river at this point. In it were placed the supplies for use on the line west of the river, while the supplies for use east of the river were cached on an old dead channel of Firebag river. The supplies for the western end of the line had been cached in March at the intersection of the 25th base line with the Fifth meridian.

On May 20 we commenced cutting trail to the Fourth meridian. This trail was kept as close as possible to the latitude of the line, so that it could be used when making the survey. The Fourth meridian was reached on June 4, and the production of the line was begun the following day.

East of the Athabaska we encountered no unusual difficulties in running the line. As the trail had already been cut the whole party worked on the production of the line, and good progress was made, the river being reached on June 9. Feed for the horses was somewhat scarce on this part of the line, but sufficient was secured.

West of the Athabaska our transportation difficulties began. Ninety-six miles of line lay west of the river, and our next cache was situated twenty-four miles south of the end of the line. We were therefore 120 miles from our next source of supply. This part of the line crossed many large swamps and muskegs, and to add to our difficulties a number of horses had died of swamp fever when working east of the river, while a number of others were suffering from this disease at the time when the transport was heaviest. The most swampy part of the line was from Athabaska river, in range 9, to the foot of Birch mountains, in range 11. The best horse feed found was on the eastern slope of these mountains. From there on the grass was scarce, and the horses suffered accordingly, but we found many good stretches of trail from range 12 to range 16, and were able to make good progress. We found some good horse feed along Birch and Louise rivers in ranges 19 and 20, and were able to rest the horses while we rafted our supplies on Birch river from the middle of range 19 to the middle of range 21.

Snow fell on September 14 and for nine days following was continually on the ground. This left the horse feed in poor condition, and we were forced to do some man-packing in the last few ranges.

We reached the Fifth meridian on October 7. I then took four men south to the cache on the 25th base line and man-packed enough supplies north to enable us to cut a trail and get our camp moved to the cache. We left the cache on October 17, and followed the old trail from Burnt lakes to Chipewyan lake and across the portage to



Wabiskaw river. From there we followed the trail along the east side of Wabiskaw river and lake to Wabiskaw settlement, and thence to Sawridge, where we arrived on November 11.

The country east of Athabaska river for twelve miles on either side of the base line is of little agricultural value, being mostly sand ridges and muskeg. This area is best suited for a forest reserve. There is very little timber of commercial value on it now, but this is because of forest fires.

The valley of the Athabaska which crosses the base line in range 9 averages a mile in width, and the river one-half mile. The depth of the river varies with the season, but is always sufficient for good steamboat navigation. Some good spruce grows along the banks, and the river flats are the best of land. Firebag river enters the Athabaska about a mile below the line. The north branch of this river crossed the line four times. It is navigable for canoes throughout almost its whole length.

From Athabaska river to the foot of Birch mountains, the soil, though wet, would make good farm land. It is composed largely of clay deposits from the hills to the west. It could be easily drained, and the water on it now is principally the result of beaver dams. There is some good poplar, spruce and jack pine in this area. The east slope of Birch mountains in ranges 11 and 12 has good soil, but is very steep in places. The timber here is good, there being much large spruce and poplar, also much white birch from which the hills no doubt derive their name. These mountains appear to be mostly glacial deposits. A few small limestone and sandstone ledges were noted on the eastern slope, but most of the cuts, and there are many, show boulder clay. From the summit in range 12 to the fifth meridian the country is almost entirely covered with moss. Underlying the moss in ranges 13, 14, 15 and 16 is a mass of boulders imbedded in clay. In that district are many lakes and shallow muskegs. In range 14 there are some large lakes which are drained by Marguerite river; this river is very probably the headwaters of Moose river. From range 15 west the high land has fewer boulders and more clay, but most of the muskegs are deeper and they are more numerous. The headwaters of Louise river start in the west side of range 14, and the line follows the drainage of this river and Birch river very closely to range 21 where Birch river swings to the northwest. In range 18 Louise river joins Birch river, which comes from the south beyond the correction line. These rivers have large areas of muskeg on either side, but back from the river at distances of from three to eight miles are hills of clay land with some boulders. These hills all have a growth of poplar, spruce and some jack pine, but here again the fires have kept the timber growth small. In range 23, the height of land between Athabaska and Peace rivers is crossed. From there the country slopes westerly along Mikkwa river valley.

Moose and caribou were very scarce all along the line, but fur-bearing animals were plentiful. The most common were beaver, fox, mink, marten, black bears, timber wolves and muskrats. Birch river was very noticeable for its many mink.

Aside from the tar sands on Athabaska and Firebag rivers no minerals were noted.

Whitefish were seen in Athabaska river and jackfish in all the large lakes and streams.



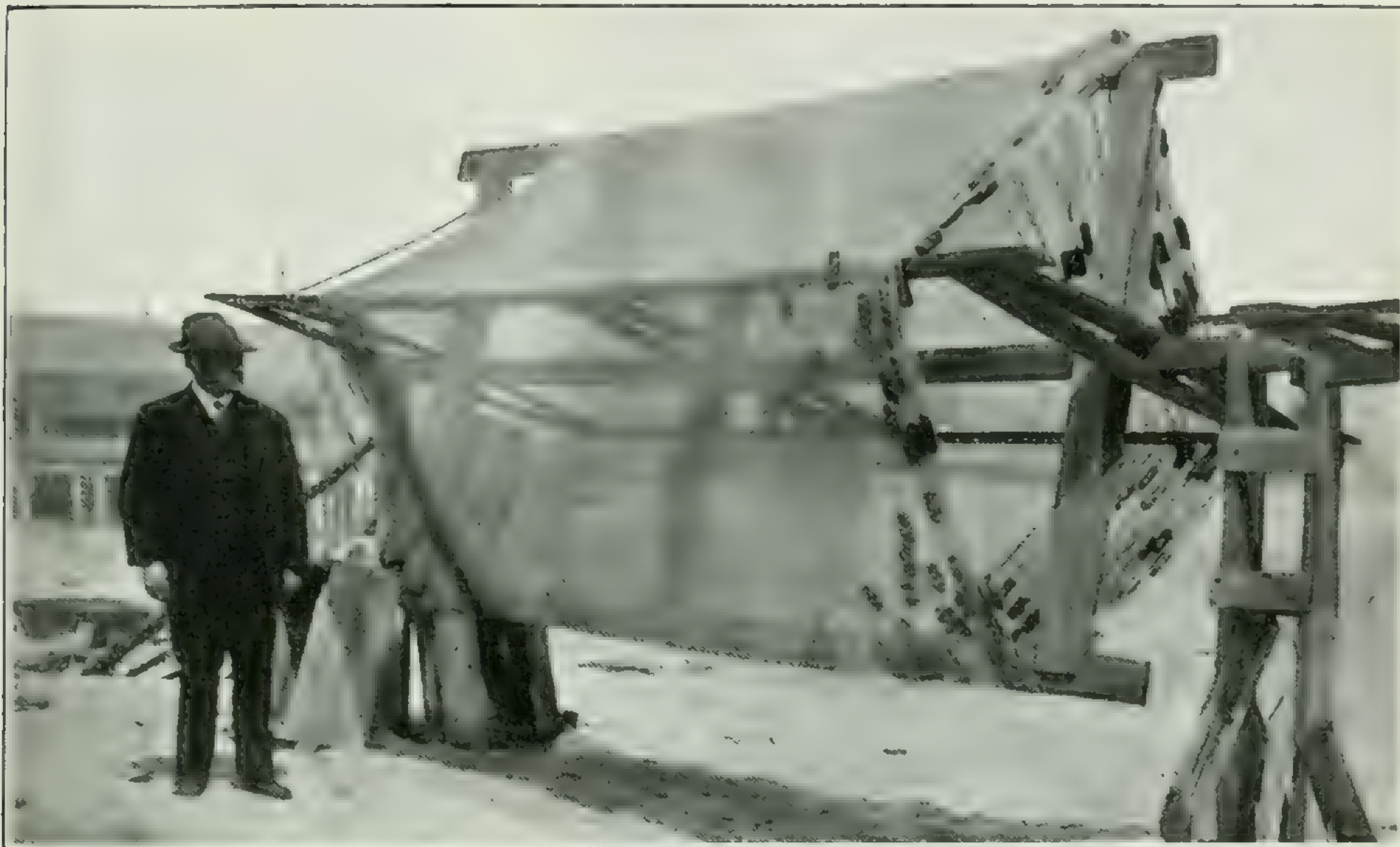


Photo by A. M. NARRAWAY, D.L.S.

#### DRYING WHITEFISH NET, LITTLE GEORGE ISLAND—LAKE WINNIPEG.

By law all nets must be taken from the water over Sunday. They are brought to the fishing station in wooden trays, one of which is shown in the lower left corner, and wound slowly on reels to disentangle the floats and leads. Each fisherman has a reel, and the inspector of fisheries can tell at a glance if the law is being observed.



Photo by R. B. McKAY, D.L.S.

#### GARDEN OF EXPERIMENTAL FARM—FORT VERMILION.

The grain and vegetables grown and ripened on this farm indicate the agricultural possibilities of the vast stretch of level country lying north and west of Fort Vermilion. The area of good agricultural land in this vicinity is estimated at over 3,000 square miles.







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## APPENDIX No. 54.

## ABSTRACT OF THE REPORT OF H. M. R. SOARS, D.L.S.

## STADIA SURVEYS IN NORTHERN ALBERTA.

My stadia surveys of the past season were begun in tp. 52-23-4, and from there I worked easterly through ranges 22 and 21.

Owing to the proximity of the city of Edmonton many of the homesteads in these townships are held by speculators, and are still in an uncultivated state. The surface, generally, is rolling, and in many places poplar and willow grow in clumps. The land is not cultivated to any great extent except in tp. 52-23-4, but dairying is carried on and a great deal of milk is shipped to Edmonton daily.

After finishing this work we moved by scow across Cooking lake to the southern part of tp. 51-21-4, where we struck the road from Edmonton to Tofield. The old trail has been abandoned, but the road allowances are so improved that there is now an excellent motor road to Tofield.

The water of Cooking lake is not good. It appears to come from springs in the centre and from the creek connecting it with Halfmoon lake. The depth averages from seven to eighteen feet, the deepest part being in the narrows, in section 35, tp. 51-21-4 and the shallowest in the bays. Very few of the settlers around this lake do much farming; they grow only sufficient grain and vegetables to meet their own wants. The locality seems especially adapted for the raising of potatoes, those obtained being of exceptionally fine quality. On the whole the district is admirably suited for mixed farming, the grazing being luxuriant, water plentiful and the market close and easy of access.

From township 51, range 21, work was carried on in an easterly direction through townships 51, ranges 20, 19 and 18, camp being moved along the Tofield trail. That portion of tp. 51-20-4 lying south of Hastings lake is very hilly, the main trail along the south cross line presenting a series of abrupt hills, but the road improvement has been so well carried out that the trail is quite suitable for the hauling of heavy loads. This township, though well adapted for mixed farming, has not been cultivated to any extent. Some very fine potato crops were noticed on the side-hills.

On reaching the vicinity of Beaverhill lake some very fine farms were seen. A very large amount of hay is annually cut along the west side of the lake. The stock in this vicinity was in splendid condition and the crops were heavy. There is a soft lignite mine in operation just south of Tofield.

To the west of the lake lie the Beaver hills, rising to a height of probably 250 or 300 feet. Cooking Lake Forest reserve covers about three townships in these hills. Unfortunately they have been burnt over on several occasions and a large amount of good timber has been destroyed.

That portion of tp. 52-19-4 lying east of the reserve, and all of tp. 53-19-4 were investigated. No great amount of cultivation has been carried out through these townships, the surface of the former being very broken and covered with dense *brulé* in many places, but both townships have been patented practically throughout.

In tps. 53 and 54-18-4 the country becomes more level and is fairly well cultivated.

The little market town of Chipman on the Canadian Northern railway in sec. 30, tp. 54-18-4 is the centre of a rich farming district and prosperity, the result of good crops and energetic farming, is most noticeable. Several carloads of stock, including sheep, cattle and hogs are shipped weekly into Edmonton.

The country on the east side of Beaverhills lake is wooded with scattered bluffs of small poplar and willow. A good percentage is under cultivation. Mundare on the Canadian Northern railway, the market town for this district, shares in the prosperity so marked through this locality.



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Beaverhills lake, which is superficially one of the largest water areas in this part of Alberta, would appear to be an overflow from the creeks that run in from the west and south and not a natural lake bed. It is very shallow, many sand-bars appearing in the centre. The average depth for a distance of ten chains or more from the shore appears to be from three to five and one-half feet. Seven feet was the deepest sounding taken. The lake is weedy. It would appear that the flooding of the surrounding meadows, which sometimes occurs, is caused more by a strong wind prevailing from the same quarter for some length of time than by excessive rainfall. The fact that this flooding occurs more in the south and southeastern parts of the lake would bear this out, as the prevailing wind in northern Alberta is from the northwest.

To summarize on the district investigated it may be stated that, with the exception of some rough land adjacent to Cooking Lake Forest reserve, the country is well adapted to any form of farming, though mixed farming would appear to be the most suitable. Truck farming in the Edmonton neighbourhood should prove a very paying venture, as early frosts do not seem to be prevalent through this district.

The country north of township 35 up to Lac la Biche and west from range 7 to the Fifth meridian appears to have had a heavy rainfall this year, but not sufficient to damage the crops. This block of land comprises the very choicest farming country in Alberta. The climate is equable and the water plentiful and good. There is sufficient timber for local use and sufficient bluffs for cattle wind-breaks. An abundance of upland and slough grass can be cut, and in many places the pea-vine is most luxuriant. East and south of this district the greater portion of the country suffered this year from drought.

On October 6 I left my assistant to complete the work in this district and to move the outfit to Edmonton, while I, accompanied by one man, left for tp. 60-12-4 to resurvey a portion of Garner lake. The trail taken lay through a district in which the majority of settlers are Russians, who appear to be very prosperous. The old Victoria trail has been abandoned and the road allowances are travelled. The country is uniformly good through Andrew in tp. 56-16-4 and on to Saddle Lake Indian reserve. On the north side of the Saskatchewan is a stretch of exceptionally fine country, but the Indian reserve covers about 140 square miles of the choicest. The townships to the north and east of Saddle lake have been well settled during the past five or six years by a very good class of settlers, principally English, French, American and Canadian.

This fertile district is only awaiting the railway facilities to be opened up by the completion of the Canadian Northern railway from North Battleford to Edmonton to become one of the most prosperous and desirable localities in Alberta. The surface is generally rolling, and is well timbered, but it can be easily cleared, where necessary. Upland grass, pea-vine and slough grass is plentiful throughout. Water is abundant and good, and many of the lakes contain whitefish, pike, pickerel and perch. It is essentially a mixed farming country.

Between these townships and Downing on the Edmonton-Victoria trail, there is a stretch of about eight miles of rather rough country covered with dense poplar. A few Russians, some of whom seem to have a preference for thickly wooded homesteads, have settled there, and are gradually developing the country.

Around Wahstao, in ranges 15 and 16 is a thriving colony of Bukowinians, who located there in 1902 and 1903. They are now in a very prosperous condition, and it is evident that Bukowina furnishes some of the most desirable mid-eastern European immigrants.

From Victoria on to Edmonton the trail runs through a uniformly good mixed-farming country.

Edmonton was reached on October 15 and the party paid off.

The work throughout the season was delayed both by the many heavy rain storms and by the thick bush which surrounded the lakes.



## APPENDIX No. 55.

## ABSTRACT OF THE REPORT OF N. C. STEWART, D.L.S.

## SURVEYS IN THE REVELSTOKE DISTRICT, BRITISH COLUMBIA.

My work for the past season consisted of the survey of lands along Columbia river, south of Golden.

I began in tp. 27-22-5 where I traversed parts of Columbia and Kicking Horse rivers together with the islands. Most of these islands are likely to be flooded at high water and are therefore of doubtful value.

On May 8, I moved by canoe up Columbia river to tp. 26-21-5. Sufficient lines were run to survey a bench of land which lies in sections 31, 32 and 29. This bench is from 300 to 500 feet above the Columbia and about a half mile in width.

From the same camp surveys were made on the west side of the river in secs. 25 and 36, tp. 26-22-5. This is a low wet area composed of marshes, sloughs, mud flats, and hay meadows.

On May 30 I moved to sec. 23, tp. 25-21-5. The bench land southwest of the river in the vicinity of this camp is narrower and more broken up by creeks, but it is a continuation of the bench land in the townships to the north. Nearly a week was spent in traversing Columbia river near this camp.

My next camp was at Carbonate Landing in sec. 8, tp. 25-20-5. The land on the benches southwest of Columbia river in this township is better than that to the northwest and the benches are larger and more numerous. Some good timber consisting of fir, spruce, jackpine and cedar, averaging about eight to ten thousand feet B.M. to the acre was found in the west half of section 5.

A pack-trail to Spillimacheen river starts at Carbonate landing. It was made many years ago during a mining boom up the Spillimacheen and now needs clearing out as it has been kept open by hunters and trappers only.

Surveys were also made on the bench land northeast of Columbia river in tp. 25-20-5. A good road giving access to this land has been built during the past two years. It joins the main road near Mallet station on the Kootenay Central railroad. Practically all quarter-sections on this bench land have been filed on. The cultivated areas at present are not very extensive, but good crops of vegetables, small fruits, and clover have been raised.

On July 25 I moved to Ore Pile landing in sec. 17, tp. 24-19-5. Specimens of the galena ore which were taken from the Spillimacheen over an old sleigh road are still to be found there, although the road itself is hardly traceable. From this camp surveys were made on the bench land west of the Columbia in townships 24, ranges 19 and 20. The bench land widens out in these townships, and there is a low divide between Columbia and Spillimacheen rivers. The soil is about the same as in the townships to the north. Nearly all the large timber has been burnt off and a dense second growth has grown up. The few creeks in the neighbourhood are small and some of them dry up in the summer. The bench land ends near the S. by. sec. 36, tp. 23-19-5, and from there to the south boundary of the railway belt the steep slopes of Jubilee mountain reach almost to the banks of Columbia river. Before leaving these townships we made a complete stadia traverse of the river and of the marshy lakes which appeared to be permanent.



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In tp. 23-18-5 I surveyed the N. and E. bys. of sec. 32 and sufficient lines to complete the survey of the low valley lands on the southwest side of the Columbia river. I also made a stadia traverse of the river and the marshy lakes.

From October 14 to October 30 I completed the traverse of Columbia river from the S. by. tp. 25-20-5 to the town of Golden. All the marshy lakes in this area were also traversed.

Every quarter-section of any value for agricultural purposes along the northeast side of the Columbia between Golden and the south limit of the railway belt has been filed upon. The settlers as a rule have come into the valley without means and consequently the amount of land cleared is small. Very few settlers have located on the southwest side of the river, owing chiefly to the difficulties of transportation across the river.

During the summer a party of engineers were engaged making a survey of the lowlands along the river between Golden and the belt limit. This I believe is the preliminary work of a company which has been formed to drain this area. Should this company be successful in their undertaking 16,000 acres of the finest land in the province will be open for settlement.

Game is very plentiful in the valley. In the fall ducks and geese are found in the sloughs in large numbers. Mountain goats can be seen on the Beaverfoot mountains any clear day and the Spillimacheen valley is famous for grizzly bears



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## APPENDIX No. 56.

## ABSTRACT OF THE REPORT OF P. B. STREET, D.L.S.

## SUBDIVISION SURVEYS IN NORTHERN MANITOBA.

I left Pas, where my party was organized, on September 28 and travelled by way of the Hudson Bay railway to tp. 69-7-Pr., where I arrived the following day.

Our work for the winter consisted of the subdivision of part of this township and other townships adjoining it to the northeast, along the railway right of way.

Our main supply camps were located close to the railway while the work was carried on from flying camps which were kept close to the lines being run. On some parts of the work the country was so strewn with windfall that we could not clear trails for the dog teams without wasting too much time, so we man-packed the supplies from the main camp. During the month of December two packers were kept busy every day, to keep the camp supplied.

In the first week of November we had a fall of fifteen inches of snow, and the weather turned cold; the muskegs, however, remained open till January. By that time the snow was two feet deep and travelling across country was very slow, especially where there was much windfall. All the creeks had frozen to the bottom and it was necessary to melt snow for our water supply. For this purpose it was necessary to keep one man in camp all the time. During the last week of January we had the only extremely cold snap of the winter; the thermometer registered from  $-40^{\circ}$  to  $-50^{\circ}$  on several occasions.

I closed operations on March 17, and returned by train to Pas.

The country covered by our surveys is mostly rolling, and is well drained by numerous small creeks. The surface is practically all densely wooded with poplar, spruce, jackpine, birch and tamarack. The timber, however, is not large enough to be of commercial value.

The southern part of this district borders on Sipiwesk lake. The country around the lake is rolling and somewhat rocky. This lake seems to have innumerable narrow bays which run inland for several miles. Its shape is the most irregular of any body of water I have ever seen, and a stranger attempting to cross it in summer might easily become lost for a week before he could locate the main outlet. It appears to be shallow and in winter a great deal of fishing for sturgeon is done on it.

Moose seemed to be plentiful north of this lake and numerous foxes and timber wolves were seen.



## APPENDIX No. 57.

## ABSTRACT OF THE REPORT OF A. G. STUART, D.I.S.

## BASE LINE RETRACEMENT AND MISCELLANEOUS RESURVEYS IN MANITOBA AND SASKATCHEWAN.

The first work undertaken was the retracement for bearings of some townships bordering on lake Manitoba, part on the north shore west of Gypsumville, and part on the west shore near Ebb and Flow lake. This was completed early in May. During this retracement we re-ran about 400 miles of line.

While carrying on the above work the snow was very deep, having drifted in among the scrub and timber to a great depth. During the warm spring days it melted so rapidly that a pair of snowshoes in the west lasted only a few days. At night a thin crust formed, which made it very inconvenient to move rapidly and during the latter part of the work we were continually wading in a foot or two of ice water as the lands immediately surrounding the lake are somewhat low and swampy.

No doubt at some future date lake Manitoba will be lowered by the dredging of the river channel linking the two lakes. This will drain large tracts of land bordering the lake, making it more fitted for agricultural pursuits.

It is also probable that at some future date the rivers joining these two immense inland seas will be made navigable and thus the future settlers of lake Manitoba will have a waterway to Winnipeg, the metropolis of the West. These lands would then be almost ideal for homesteads as the soil is rich and there is an abundance of wild hay, building material, wood, game, and whitefish.

Upon the completion of this retracement I organized a larger party to retrace the 2nd base line between the Second and Fourth meridians, and also the Fourth meridian from the international boundary northerly over sixty-one townships. These surveys were necessary in order to check the accuracy of the original work.

Lines of levels and check levels were carried over the outlines retraced, elevations being established in the towns in the vicinity of the work, and connections made with several other lines of levels, including railway, irrigation, and precise levels of previous surveys. These levels were reduced to mean sea-level datum and added to the network of levels already taken over the western provinces, which will some day be of immense value in the development of the country.

There is little doubt that in future years these provinces will need and be supplied with hydro-electric power on an even greater scale than it is being developed at present in the province of Ontario; at such a time the levels will be very useful. Large sums of money are being spent yearly on graded roads and with the ever-increasing usefulness and popularity of power vehicles has come a demand for national highways such as is at present being felt in the Western States, and the system of levels taken in connection with Dominion lands will again prove its usefulness, while in many places in the northern part of the provinces drainage problems on a large scale will be made easier.

Sixty-nine miles of the base lines closing on the meridian were retraced for bearing.

In the Wood mountains and Cypress hills, which were crossed by our surveys, there is an abundance of wooded country supplying the settlers in the surrounding prairie with building material and fuel. In the latter place there is a national



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forest reserve where restrictions are enforced for the preservation of growing timber. Homesteaders come to this place during the winter months for a distance of sixty miles in order to obtain fire-wood.

In southern Saskatchewan soft coal was obtained from local mines in many instances. In this district ranching on large tracts of leased land is carried on extensively. The country appears to be much more suitable for this purpose than for farming on a small scale.

During the season, besides the retracement around lake Manitoba, 750 miles of outline were retraced, 60 magnetic observations were made and about 325 azimuth observations were taken and computed.



## APPENDIX No. 58.

## ABSTRACT OF THE REPORT OF C. H. TAGGART, D.L.S.

## SURVEYS IN KAMLOOPS DISTRICT, BRITISH COLUMBIA.

The principal work on which I was engaged during the season was the delimitation of the north boundary of the railway belt westerly from North Thompson river. A few other small surveys were also made before this work was commenced.

In tp. 22-16-6 we traversed a portion of Hefley creek. To reach this work we travelled north along North Thompson river, then east along Hefley creek. The city of Kamloops has a transmission line along the river to their power-house on Barrier creek, about forty miles north. The available head of water there is about one hundred and eighty feet and the available horse-power is said to be 20,000.

The transmission line crosses large areas of valuable land which need only irrigation to make them productive. It is now possible that nearly all of this land can be brought under cultivation by using this electrical power to pump water from the river, provided that the rates are not prohibitive.

Having finished the work in township 22, range 16, on April 24, we moved back to Kamloops, and then following the wagon road easterly along the north side of South Thompson river, we reached tp. 20-14-6, where we were engaged until April 28 running section lines.

In this township, on the bench lands above South Thompson river, many settlers have located, and are trying to raise crops with the dry farming method, but with what success it is rather difficult to say, as only a small area has as yet been cultivated.

On April 29, we again moved to Kamloops, and on the following day left for tp. 23-17-6, by way of the wagon road along the west side of North Thompson river.

The first thing of note after crossing Thompson river west of Kamloops, and passing through North Kamloops, is the new townsite recently laid out along the Canadian Northern railway. Just to the east of this townsite the railway crosses the North Thompson on a fine steel bridge of the lift-span type, which I understood is the first of its kind in Canada. Station grounds have been laid out just west of and adjacent to the wagon road. It is in this vicinity that it is expected the new railway shops are to be erected.

All the bottom lands along the west side of North Thompson river, with the exception of a few holdings, belong to the British Columbia Fruitlands company, who also have extensive holdings along Thompson river between the North Thompson and the Kamloops lake. A fine up-to-date irrigation system has been constructed to carry water for the irrigation of these lands. The water is taken out of Jamieson creek about three hundred yards west of the wagon road crossing, and conveyed to the lands by concrete-lined canals and underground concrete pipes. The main canal is fifteen or sixteen miles long and follows close to the foot of the hills. Where the main canal passes a large rock slide, an inverted syphon has been constructed, which is at least half a mile in length. The intake and outlet bases are built of reinforced concrete, and the syphon consists of a forty-eight inch continuous wood stave pipe laid underground. A very large amount of money has been spent by this company to construct their irrigation system. The chief crops grown on the lands above mentioned are hay, and some fruit.

The limit of the railway belt after crossing the North Thompson passes over the Jamieson range of hills, which are about 2,500 feet above the river. The fact that our



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camp had to be located along the river, and, that after the first couple of days this climb had to be made before a day's work was begun, made progress slow.

The line was produced westerly until well down the west slope of the range, so as to be easily picked up after establishing a new camp on Jamieson creek.

We decided that it would be very difficult to construct a trail over the Jamieson range, and that it would be simpler and much quicker to go around and use the old trail up Jamieson creek. We therefore moved our outfit to the head of the British Columbia Fruitlands company's irrigation ditch, where we made our cache, and started to rush supplies up to the line, as it was feared that the creek was liable to be soon in flood, which would make transportation difficult. Unfortunately the weather turned very warm and, augmented by two days' heavy rain in the mountains, the freshet water started down from the hills, and before we could make the trail passable for pack trains, Jamieson creek had become a roaring torrent, washing out bridges, and making fords practically impassable.

Jamieson creek flows in a narrow valley and to get up at all with a pack train the stream has to be crossed many times, and in all but one place bridges had to be built. Considerable time was lost from the actual line work by these operations. It was found necessary to pack hay and oats for the horses as the vegetation on the hills was of no value for horse feed.

From the crossing of the north fork of Jamieson creek to the high land in sec. 28, tp. 23-18-6, the belt limit passes over rough broken country mostly wooded with a dense growth of small fir, with much standing and fallen dead timber. Wentworth lake in section 28 has been converted into a storage reservoir for irrigation waters for the lands belonging to the British Columbia Fruitlands company. Alexander lake, about three miles due west from Wentworth lake, is also a reservoir, in which the west fork of Jamieson creek rises.

While working in the neighbourhood of Wentworth lake the weather was very bad, with snow, sleet and cold rains. On June 6, 7 and 21 heavy snowstorms were experienced; in fact while working in this vicinity three to four feet of snow was still on the ground.

We carried the line westward to the NE. corner of sec. 14, tp. 24-20-6, where we connected with that part of the "belt limit" previously run. My next work consisted of the subdivision of all the unsurveyed lands in the vicinity of Criss creek, in township 24, ranges 20 and 21, and a few miles in township 23, range 21.

Criss creek with its many tributaries drains a large area of country. The main creek appears to rise in Tsintsunko and Caribou lakes which are in provincial lands just north of tp. 23-18-6. These lakes could be well utilized as storage reservoirs for irrigation waters. During the spring freshet Criss creek is a large roaring stream, but as soon as the run off is over the stream becomes practically dry in an average season. A water power development of some size might be possible of the Tsintsunko lakes. Between the large lake to the south of the group and the northerly one there is a fall of from ninety to one hundred feet.

The subdivision in this district was completed on August 30, and I then started the production of the northerly limit of the railway belt westerly from the north boundary of sec. 8, tp. 24-21-6.

Deadman river flows in a narrow valley bounded by steep rugged hills with many narrow canyons. The belt limit crosses the north end of Mowich lake which is an expansion of Deadman river. To the northward about a mile is Deadman lake, which is now used as a storage reservoir for irrigation waters, a splendid dam having been built at the south end of the lake. The waters are used on lands belonging to a company operating very extensively at Walhachin.

A little difficulty was experienced in getting a pack-trail up the west side of Deadman valley, but we were fortunate to find a passable route, and finally located



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a camp above the river. Between this point and Hihium lake a rolling plateau is crossed, which like most plateaus in this district is about 4,000 feet above sea-level, and well wooded with pine and small fir. Occasional wild hay meadows were seen, but their size is too small to be of any great value.

Cattle and horses in large numbers were seen ranging over this country and for this purpose the country is well adapted. It seems to be best suited for sheep ranging.

Hihium lake in tp. 24-23-6 is a large body of water; its altitude is from 4,500 to 5,000 feet, and its waters abound with fine trout. Ducks and geese were seen there in large numbers, also deer and bears. The outlet of this lake is a creek by the same name, which flows westerly into Loon creek, a tributary of Bonaparte river.

From Cultus Lake post office on Deadman river a pack-trail leads over the hills, and at the summit branches, one branch going north to the north end of Loon lake, which is in provincial lands, and where a small settlement is to be found; the other branch goes westerly to Hihium lake.

From Hihium the belt limit gradually descends to Bonaparte river valley. The country is rough and rugged and well timbered with jackpine, bullpine and fir.

After making ties to the monuments previously established, where the line crosses the Bonaparte, it was produced westerly and tied to the monument establishing the railway belt limit on the Cariboo road, in tp. 23-26-6. Subdivision and retracement surveys were then made in the vicinity of Maiden creek and Bonaparte river, the work being completed on October 26.

Along the old historic Yale and Cariboo wagon road, on which our last camp was located, but very little life was noticed, compared with former days. Only occasional freight teams or automobiles were to be seen. With the opening of the Grand Trunk Pacific railway, freight is now brought into Fort George to supply all the upper country. With the addition of the Pacific and Great Eastern railway, which is being rushed to completion, Fort George and Vancouver will be joined, and this upper country will be well served with railroads which will add much to the development of this vast area.

Large droves of fine beef cattle were seen coming down the Cariboo road which would indicate that the upper country is an excellent cattle country.

I took the party back to Kamloops, paid off the men, and with my assistants went a few miles south of Kamloops to section 4, township 20, range 18 to investigate and make retracement surveys along the Kamloops and Savona wagon road across the Nighthawk mineral claim. This work was completed on October 31.

My last work was a stadia survey of the improvements to be found on the southeast quarter of sec. 12, tp. 18-12-6 which was completed on December 23. The weather conditions throughout the district were fine, but from the farmer's standpoint it was considered very dry. On lands where irrigation was used the crops were very good, but where the dry farming methods were practised, crops suffered from lack of moisture.



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## APPENDIX No. 59.

## ABSTRACT OF THE REPORT OF C. M. WALKER, D.L.S.

## SURVEYS IN THE ROCKY MOUNTAINS PARK, ALBERTA.

My first work consisted of a resurvey of those portions of blocks 1 and 2, Banff townsite, which border on Banff avenue. When the correct positions of the lot corners had been determined, holes were drilled through the concrete sidewalk and posts were placed at one foot offset to mark these corners. Cement was tamped around the posts, while they were held in true position, thus ensuring accurate and permanent monuments.

I next proceeded to outfit a party for the resurvey of the townsite of Canmore. Considerable difficulty was experienced in locating any suitable monument as a starting point, though eventually two original iron block corners were discovered at a distance of half a mile from the town. The survey of the townsite was accordingly carried out with these corners as reference posts.

On completion of this resurvey, we continued the traverse with levels of the Calgary-Banff auto road, from the point at which it was stopped in 1913 eastward to the boundary of the park, a distance of about twenty-two miles.

We next moved to Banff and made traverses, with levels, along part of the left bank of Bow river, and of two islands in the river. We then made the necessary surveys to determine contours over the westerly slopes of Tunnel mountain with a view to further extension of the townsite of Banff in that direction.

Our chief work during the season consisted of the survey of an addition to the villa lot section of Banff, including preliminary traverses with levels along the proposed roads and final posting of all lot and block corners by right-angled offsets from the preliminary traverse lines. We also ran preliminary surveys for a road around the eastern side of Tunnel mountain, connecting with Tunnel mountain road as outlined by Mr. Mawson, and also for a branch road connecting with the Calgary-Banff auto road at Anthracite and running direct to lake Minnewanka, a distance of about four miles.

This work in the villa lot section, together with the survey of an additional subdivision in the north end of the townsite, was continued uninterruptedly until September 23, when we moved to Bankhead in order to lay out a cemetery at that place, on a tract of land chosen for the purpose by the Parks Branch.

Upon completion of this work we again moved to Banff and finished the survey of villa lots as far as we had instructions, whereupon the party was disbanded on October 21.



APPENDIX No. 60.

REPORT OF J. N. WALLACE, D.L.S.

LEVELLING IN MANITOBA, SASKATCHEWAN AND ALBERTA.

I have the honour to submit the following report on levelling operations carried out during the year ended March 31, 1915.

The work may be classified into: (1) Levels taken along meridians and base lines during their survey; (2) lines of precise levels which are run, for the most part, along railway lines, and (3) work done in the office at Calgary.

A general report on all levelling operations from their inauguration in the year 1908 to the end of October, 1914, has been prepared during this past season, and is now being printed. It gives an historical and descriptive account of the work, and contains a summary of the results, this summary including the elevations of some 8,900 points spread over the country from southeastern Manitoba to the northwest of Peace River block.

Steady progress has been made in running lines of levels. The mileage run during the past twelve months is as follows:—

|  |        |
|--|--------|
|  | Miles. |
| Meridian and base line levels. New lines.. . . . | 2,309  |
| Precise levels. New lines.. . . .                | 505    |
| Precise levels. Revised in the field.. . . .     | 274    |
| <hr/>  |        |
| Total for the season.. . . .                     | 3,088  |

The following table shows the mileage of all levels run in each season from their inauguration to the end of this past season, each season being considered as extending to March 31 of the following year:—

| Season.          | Meridian and<br>base line<br>levels. . | Precise<br>levels. | Other<br>levels. |
|------------------|--|--------------------|------------------|
|                  | Miles.                                 | Miles.             | Miles.           |
| 1905 . . . . .   | 114                                    |                    |                  |
| 1908 . . . . .   | 116                                    |                    |                  |
| 1909 . . . . .   | 613                                    |                    |                  |
| 1910 . . . . .   | 757                                    |                    |                  |
| 1911 . . . . .   | 1,326                                  |                    | 116              |
| 1912 . . . . .   | 1,433                                  | 497                | 70               |
| 1913 . . . . .   | 1,992                                  | 567                | 72               |
| 1914 . . . . .   | 2,309                                  | 505                |                  |
| Totals . . . . . | 8,660                                  | 1,569              | 258              |

Total of all lines of levels, 10,487 miles.

The mileage stated for precise levels in season 1914 does not include 274 miles revised in the field.



## SESSIONAL PAPER No. 25b

*Meridian and Base Line Levels.*

These levels are run along meridians and base lines during their original survey. As the lines are surveyed in advance of settlement the levels afford the first information of elevations of the various features of the country. They are carried out with a considerable degree of accuracy, the instructions requiring each mile to be checked within the limit of one-tenth of a foot per mile between the two separate levellings in opposite directions. The instrument used is a fourteen-inch dumpy level, with inverting telescope.

The information recorded includes the elevation of the ground at every quarter mile, and in addition the elevation of the water in all streams, lakes and swamps crossed by the lines. Bench-marks for future reference are established at distances not greater than a mile apart. The mark most commonly used is a spike left in a tree, but marks are left on rocks or firm boulders if such are available. All elevations are referred to mean sea-level.

As already stated, 2,309 miles of levels of this class were run during the past year. It is convenient to deal with these from east to west and from south to north, grouping them in order of the meridians, commencing with the Principal meridian.

In the southern part of Manitoba ninety-eight miles of outline were run near the east shore of lake Winnipeg. The 13th and 14th base lines, which had been run easterly from the Second meridian, were completed to the west shore of that lake, thirty-six miles of these two base lines being run during the past year. A considerable amount of levelling was done in central and northern Manitoba. The Principal meridian was extended from township 80 to township 88, its northerly end being now about thirty miles south of the crossing of Churchill river. To the east of this meridian parts of the 21st, 22nd, 23rd and 24th base lines and of certain connecting meridian outlines have been run and a connection following the vicinity of Nelson river and the Hudson Bay railway has been established and the seaboard reached at Port Nelson.

The datum used to extend the levels into northern Manitoba, and along the Hudson Bay railway to the sea, has been derived from a long connection levelled up from the south. It originates at a bench-mark of the United States Coast and Geodetic Survey established at Stephen, Minnesota, about forty miles south of the international boundary. From there levels were carried northwesterly by the Geodetic Survey over railway lines by way of Emerson and Regina to Warman. From there levels were continued by this branch northerly along the Canadian Northern railway to Prince Albert, easterly to Hudson Bay Junction, northeasterly to Pas, and then 100 miles farther, along Hudson Bay railway, to the intersection of the 17th base line, which forms the north of township 64. Beyond this point the connection follows the 17th base line easterly to the Principal meridian, and then north and east along meridians and base lines to Port Nelson. The total length of this route, from Stephen, Minnesota, to the sea at Hudson Bay, is 1,580 miles. Connection has been made with the tide gauge at Port Nelson, but a comparison with mean sea-level has not yet been worked out.

Owing to deficiencies in the original levels which had been run in previous seasons along the Second meridian from the crossing of Saskatchewan river to township 80, these levels were re-run this season. For the same reason, the levels previously run along the 15th base line west of this meridian are now being revised.

The original survey of the 2nd base line, which was made many years ago, was retraced this season from the Second meridian as far west as the Fourth meridian. Advantage was taken of this survey to run a line of levels along the base line over the prairie, no levels having been run in that district before. The only other line of levels run between the Second and Fourth meridians during the past year consisted of eleven ranges of the 16th base immediately to the west of the Second meridian.



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This base line had been previously run east from the Third meridian and the survey of these ranges completed it between the meridians.

In addition to the levels over the prairie along the 2nd base line, a large mileage of prairie levels was run along the Fourth meridian during its retracement the levels extending from the international boundary to Saskatchewan river in township 53. No levels have been run along this meridian between townships 53 and 60, but north of the latter township, levels have been already carried along the meridian to lake Athabaska in township 115 which is 690 miles north of the international boundary.

In the country near Athabaska river and north of McMurray two surveyors were at work. One of these completed the parts of the 24th and 25th base lines westerly from the river to the Fifth meridian and the other ran the 26th base, from the Fourth meridian to the Fifth. The completion of these base lines has resulted in the levels along the two meridians being now connected to eight different base lines.

The Fifth meridian was not advanced this season. It had already been extended to township 112, a few miles north of where it crosses Peace river, about seventy miles east of Fort Vermilion; two surveyors were engaged on the survey of base lines west of this meridian. The first continued to survey the 26th and 27th base lines easterly to the Fifth meridian, completing the parts between the meridian and range 17 and range 9 respectively. The second surveyor ran the 29th base westerly from the extreme north end of the Fifth meridian to the longitude of the Sixth meridian. The latter meridian has not yet been surveyed north of township 90, so that no closing is as yet available for the westerly end of the levels of the 29th base line. This base line is the most northerly one yet surveyed. It passes about twenty-six miles north of Fort Vermilion settlement on Peace river.

The only levels run last season in the country west of the Sixth meridian comprise a line along that part of the west boundary of Peace River block, which extends from township 81 to township 84. This line afforded a much needed connection to sea-level for several hundreds of miles of levels in the southerly part of this block.

Although many base lines have been wholly or partly run between the Fifth and Sixth meridians, there is only one line of levels, namely, that along the 23rd base line, which extends across the entire distance between the meridians. The result is that there is only this one connection to sea-level for all the levels, amounting to 528 miles, run along the Sixth meridian and the base lines in Peace River block.

#### LINES OF PRECISE LEVELS.

Two level parties were employed in the field, one under Mr. L. O. R. Dozois, D.L.S., from May 13 to October 26, and the other under Mr. J. T. Carthew, D.L.S., from June 11 to August 7, after which date the party was in charge of Mr. E. W. Berry, D.L.S., until January 25, 1915.

One party under Mr. Dozois commenced work at Winnipeg and levelled along the Canadian Northern railway to Swan river, running spur lines of levels from Portage la Prairie to lake Manitoba, from Ochre river to lake Dauphin and from Sifton Junction to lake Winnipegosis. These levels amounted in all to 321 miles. Connections were also made along the line, run the previous season, between Swan River and Hudson Bay Junction. The line of levels from Winnipeg to Edmonton has now been completed. The route followed is all along the Canadian Northern railway by way of Portage la Prairie, Gladstone, Dauphin, Swan river, and Hudson Bay Junction to Prince Albert, then south to Warman and west to Edmonton. The distance from Winnipeg to Edmonton by this route is 958 miles. At Edmonton connection is made to a line from Calgary, making a total length of 1,157 miles of continuous levelling.

In running these levels along railway lines permanent bench-marks have been left at average distances of about five miles apart, at least one being



## SESSIONAL PAPER No. 25b

left near every railway station, whether the country is settled or not. In many cases two bench-marks have been left near the stations and where questions of transport allowed it, additional bench-marks have been left midway between stations. These bench-marks consist of copper bolts fixed in stone or concrete buildings or bridges, or in special concrete pillars. The elevation of every railway station, and of the water in every stream, is also determined, as well as the elevations of many of the road crossings. These are all taken as intermediate sights, after the elevations of the main line turning points have been recorded at the instrumental stations. They do not, therefore, interfere with the accuracy of the main line of levels.

A great difficulty in running precise levels arises from the liability of making clerical errors in the field record. The method used consists of a continuous summation of the separate rise or fall which occurs in each mile section. No regular rule can be followed in regard to the order in which the duplicate lines are run forward or backward over a section. In fact the order is necessarily not uniform. A careless reversal of the entry of direction of running a particular section may, therefore, lead to a rise being recorded as a fall, or vice versa. The same trouble of inversion may also occur through confusion in entering a foresight for a backsight. To reduce this danger, a method is being tried of having the recorder make independent approximate readings of the rod after the leveller has completed the precise readings at each instrumental station.

The other party under Mr. Carthew commenced work at Prince Albert and levelled over the branch line of the Canadian Northern Railway to Big River, a distance of eighty-five miles. It is the intention at some future date, to continue this line of levels northerly down the general course of Beaver river.

Work was next commenced at Hudson Bay Junction, and a single line of levels was run over the railway from there to Pas, a distance of eighty-seven miles. This had been already levelled in the previous year, but the elevations of the railway stations and many of the streams had been omitted and the distances between bench-marks had been too long. The single line was run to remedy these matters, and generally to check the original line. No second, or check line, was run if this single line checked with the original determinations at the end of a mile section within one-tenth of a foot. In such case the original elevation was retained and the new line was used only to determine the intermediate new elevations. If a greater discrepancy occurred an investigation was made by further levellings.

On reaching Pas the total disagreement between the single line, the elevations of which were carried through independently, and the mean of the duplicates of the original line amounted to 0.130 foot, in addition to an error of 1.100 feet which was found to have been made in a certain mile of the original line. Correction has been made for the error of 1.100 feet but otherwise the original elevations have been retained.

The line of levels was continued from Pas northeasterly along the Hudson Bay railway. As this was a new line duplicate levels were run in the usual manner. This new line was extended to a point ninety-nine miles from Pas. Here work ended on November 10, and the party returned to Prince Albert. A single line of levels was run from Prince Albert to Hudson Bay Junction, a distance of 162 miles. This line had been run in the year 1912, but was now re-run for reasons similar to those stated for re-running the line from Hudson Bay Junction to Pas. The elevations of numerous streams had been omitted and were now recorded. The total discrepancy between this single line of levels and the mean of the original duplicate levellings amounted to 0.186 foot at the end of the 162 miles. No local error was discovered in the field work of the original line, and no change has been made in the original elevations.

The following tables show the lines of levels along meridians and base lines, and also the lines of precise levels, run from April 1, 1914 to March 31, 1915.



Meridian and Base Line Levels.

| Line.   | Town-<br>ships or<br>Ranges. | Surveyor.           | Miles. |
|---|------------------------------|---------------------|--------|
| Second meridian east .. .. .                              | 85-88                        | G. H. Herriot ...   | 24     |
| Second " " .. .. .  | 89-92                        | B. W. Waugh ....    | 24     |
| 23rd base east of Second meridian east.....               | 1-11                         | G. H. Herriot ....  | 66     |
| 24th " " " " .. .. .                                      | 1-10                         | B. W. Waugh ....    | 60     |
| 24th " " " " .. .. .                                      | 11                           | G. H. Herriot ...   | 6      |
| East outline, range 11, east of Second meridian east..... | 89-92                        | " .....             | 24     |
| Principal meridian.....                                   | 81-88                        | A. H. Hawkins....   | 48     |
| 6th base line east of Principal meridian.....             | 10                           | A. M. Narraway..    | 6      |
| East outline of range 1 east.....                         | 45-48                        | " .....             | 24     |
| East " " 3 " .. .. .                                      | 38-44                        | " .....             | 42     |
| 12th base line east of Principal meridian.....            | 2-3                          | " .....             | 12     |
| 13th " " " " .. .. .                                      | 1-3                          | " .....             | 14     |
| 13th " west " " .. .. .                                   | 13-14                        | T. H. Plunkett....  | 10     |
| 14th " " " " .. .. .                                      | 11-16                        | " .....             | 30     |
| 19th " east " " .. .. .                                   | 1-5                          | G. H. Herriot ....  | 30     |
| East outline of range 11 east.....                        | 81-84                        | B. W. Waugh ....    | 24     |
| 21st base line east of Principal meridian.....            | 10-11                        | " .....             | 12     |
| 21st " " " " .. .. .                                      | 12-20                        | G. H. Herriot ...   | 54     |
| 22nd " " " " .. .. .                                      | 1                            | A. H. Hawkins....   | 6      |
| 22nd " " " " .. .. .                                      | 12-20                        | B. W. Waugh ....    | 54     |
| 22nd " " " " .. .. .                                      | 21-22                        | G. H. Herriot ....  | 11     |
| 22nd " west " " .. .. .                                   | 1                            | A. H. Hawkins....   | 6      |
| 23rd " east " " .. .. .                                   | 21-22                        | B. W. Waugh ....    | 10     |
| East outline of range 20 east.....                        | 81-84                        | G. H. Herriot ....  | 24     |
| East " " 20 " .. .. .                                     | 85-88                        | B. W. Waugh ....    | 24     |
| Second meridian.....                                      | 56-85                        | A. H. Hawkins....   | 173    |
| 2nd base line west of Second meridian .. .. .             | 1-30                         | A. G. Stuart.....   | 178    |
| 15th " " " " .. .. .                                      | 1-21                         | A. H. Hawkins....   | 127    |
| 16th " " " " .. .. .                                      | 1-11                         | E. S. Martindale..  | 66     |
| 2nd " " Third meridian.....                               | 1-30                         | A. G. Stuart.....   | 178    |
| Fourth meridian .. .. .                                   | 1-53                         | " .....             | 318    |
| 24th base line west of Fourth meridian .. .. .            | 12-25                        | G. H. Blanchet....  | 83     |
| 25th " " " " .. .. .                                      | 13-25                        | " .....             | 76     |
| 26th " " " " .. .. .                                      | 1-25                         | F. V. Seibert. .... | 146    |
| 26th " " Fifth meridian.....                              | 1-17                         | J. A. Fletcher....  | 102    |
| 27th " " " " .. .. .                                      | 1-9                          | " .....             | 51     |
| 29th " " " " .. .. .                                      | 1-24                         | J. R. Akins .....   | 142    |
| West boundary, Peace River block .. .. .                  | 81-84                        | L. Brenot.....      | 24     |
| Total .. .. .   |                              |                     | 2,309  |

Lines of Precise Levels.

| Line.                                       | From                | To                   | Railway.            | Surveyor.           | Miles. |
|---|---------------------|----------------------|---------------------|---------------------|--------|
| P   | Prince Albert ..... | Big River.. .....    | Can. Nor. Ry... ..  | J. T. Carthew . .   | 85     |
| Q   | Winnipeg.....       | Swan River.....      | " .....             | L. O. R. Dozois.... | 321    |
| J   | Pas .....           | 17th base line. .... | Hudson Bay Ry... .. | E. W. Berry.....    | 99     |
| Total .. .                                  |                     |                      |                     |                     | 505    |
| Lines Revised.                              |                     |                      |                     |                     |        |
| G   | Prince Albert.....  | H. B. Junction. .... | Can. Nor. Ry.....   | E. W. Berry.....    | 162    |
| J   | H. B. Junction..... | Pas.....             | " .....             | " .....             | 87     |
| Short lengths along other lines.....        |                     |                      |                     |                     | 25     |
| Total.....                                  |                     |                      |                     |                     | 274    |
| Total of all lines run during the year..... |                     |                      |                     |                     | 3,088  |





Photo by H. S. HOLCROFT, D.L.S.

#### RUINS OF OLD AMMUNITION BUILDING—CHURCHILL.

The whole building except this one chamber is in ruins. About 150 yards away are the ruins of the Battery for which the Ammunition shed was built. This Battery, erected about 150 years ago by the Hudson's Bay Company, commanded the entrance to Churchill harbour.



Photo by H. S. HOLCROFT, D.L.S.

#### HUDSON'S BAY COMPANY'S STORE—YORK FACTORY.

Some of these buildings are more than 100 years old. They are constructed of heavy timber and are yet in good condition. The building on the extreme left is the present local store, the other buildings being used as storehouses.







## SESSIONAL PAPER No. 25b

*Work in Calgary Office.*

All the level books, both those of the meridian and base line surveyors and those of precise level lines, have to be checked. The examination includes checking the reductions, and making a careful scrutiny of all places where the routine methods were not followed in the field work. This last is very laborious, but very important, as it is in such places that errors may enter the work.

As regards the books of meridian and base line levels, these are first examined in a preliminary way and a statement made out showing what additional information is required from the surveyor. This is usually concerned only with the chainage of the topographical features and sketches of the crossings of lakes and rivers. The books themselves are, as a rule, the only available source of information regarding any matters of actual elevation.

The connection of the datum by the surveyor to the best available sea-level datum must then be investigated. This is generally very complicated since the connection is dependent on many lines run on different datum planes. The collating of these assumed datum planes has to be checked and revised again and again. The books are then checked page by page, and any clerical or other errors are noted.

A list of the bench-marks giving their positions, descriptions and elevations is next prepared. Each line is kept separate. The elevations of the bench-marks are the real foundation of the whole system. These are recorded in the field to hundredths of a foot. In compiling the lists of each line, when a surveyor has commenced his work off some previous line, the initial bench-mark heads the lists, and is given the same elevation as it has in the list of the previous line which has always been reduced to sea-level, if such a datum has been available. The same datum is used for all the bench-marks on the new line. When the line terminates by closing on a bench-mark of some other line as, for example, when a base line is run from one meridian to the next, the terminal bench-mark is listed at the end of the new line with the elevation carried through. A comparison of this with its elevation in the list of the line on which it was originally established, serves at once to show the closing error.

This method of listing each line independently places the lists in a form readily available for future adjustment, when sufficient circuits have been run in the field to clear the lines of all but small accidental errors, and it avoids the confusion which would inevitably follow a general adjustment made before sufficient work has been done in the field.

The elevations of the natural features along each line are also compiled in lists. These include the elevation of the ground at the foot of the section and quarter-section posts, about midway between them, and also the elevations of all streams and other water, the distances of each feature from the northeast corner of the particular section being stated. These lists are placed on file, and condensed lists giving, as a rule, only the ground at the northeast corner of each section and the more important other features, are compiled from them for publication.

The draft lists of both bench-marks and natural features are first made out with the elevations recorded in the field books, and then the necessary constants are applied to the draft elevations to reduce them to sea-level, and to correct any clerical errors carried forward inadvertently in the field books.

All lists are made out running north or west independently of the way the line was run in the field. This involves a good deal of extra work, but results in uniformity and clearness.

A profile of each line is made on a horizontal scale of 120 chains to one inch and a vertical scale of 250 feet to one inch. This is a ratio of 1-32, a more exaggerated one than that used on railway profiles, which latter is usually 1-20. The small horizontal scale used, however, requires a greater exaggeration than that shown on a railway profile, in order to clearly bring out small local inequalities.



The office work in connection with precise levels involves a mass of detail. It includes checking the summation of all the rod readings, and of the stadia intervals in each mile section, checking the transference to the abstract book of the rise and fall in each section, the stadia distance, and the partial discrepancies. The field notes of every mile of levels contain about 480 figures, all of which have to be checked in some form or another.

After the precise level books have been checked a list is prepared for each line giving the positions, descriptions and elevations of all the permanent bench-marks and a further list is made which includes all the other elevations, such as those of railway stations, streams, road crossings, etc. It has been the practice so far, to include in the latter lists the temporary bench-marks at the end of the mile sections. These temporary bench-marks are undoubtedly of great service for future local reference in the field where precision is not required.

The following table gives a summary of the work done in the office during the past twelve months. This is exclusive of the work of compilation of the general report on levelling, previously referred to, which involved the collating and reduction of 8,900 elevations spread over 9,689 miles of levels, and is also exclusive of the re-examination of books dealing with field work done previous to the last two seasons, which is continually going on.

It was supposed, when the levels were first inaugurated along meridians and base lines, that once the lists were made out no further reference would be made to the books but this has proved to be quite a mistake. Continual reference must be made to the original notes and this practice has undoubtedly done much to keep the office records of the whole system so remarkably free from error.

|   | Original<br>Meridian and<br>Base Line<br>Levels. | Original<br>Precise<br>Levels. | Other<br>Levels. | Total. |
|---|--|--------------------------------|------------------|--------|
| FIELD BOOKS.  |  |                                |                  |        |
| Received from the field, April 1, 1914 to March 31, 1915..... | 133  | 55                             | 19               | 207    |
| Miles of levels recorded in these .....                       | 2,352  | 599                            | 337              | 3,288  |
| Field books, entirely examined.....                           | 120  | 55                             | 19               | 194    |
| Field books, partly examined .....                            | 29   | .....                          | .....            | 29     |
| BENCH-MARKS.  |  |                                |                  |        |
| Number of bench-marks compiled for the first time.            | 2,837  | 568                            | 29               | 3,434  |
| Number of miles in which they occur.....                      | 2,227  | 599                            | 337              | 3,163  |
| PROFILES.   |  |                                |                  |        |
| Number of sheets completed .....                              | 62   | .....                          | .....            | 62     |
| Number of miles on same .....                                 | 2,401  | .....                          | .....            | 2,401  |

REPORT OF L. O. R. DOZOIS, D.L.S.

PRECISE LEVELS FROM WINNIPEG TO SWAN RIVER.

(To accompany report of J. N. Wallace, D.L.S.)

I left Calgary on May 13, 1914, and reached Winnipeg on the 14th. From this date until the 18th the time was taken up in making preparations for field work.



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Permission was obtained from the Canadian Northern railway to run the line of levels along their track from Winnipeg to Swan river, the conditions being the same as contained in an agreement which had been in force in former seasons. As this line runs within a short distance of lake Manitoba and lake Winnipegosis it was desirable that the elevation of the water in these lakes should be accurately determined. In the case of such large lakes the only satisfactory way to have their variations recorded is by gauge readings at frequent intervals, and to have the zero of the gauge connected to a known elevation above sea-level. In connection with this matter I consulted Mr. Scovil, Acting Chief Engineer of the Manitoba Hydrographic Survey. He agreed to have gauges placed at Delta on the shore of lake Manitoba, and at Winnipegosis on the shore of lake Winnipegosis, and also at the eastern and western sides of Meadow portage, which is a narrow stretch of land, about two miles wide, separating the two lakes. It was further arranged that I should establish bench-marks of as permanent a nature as possible to the shores of these lakes.

This arrangement was an additional benefit to us as it afforded a check on our levels between Delta and Winnipegosis, a distance of 190 miles. It has since been found that our levels and the water levels by way of the lakes as ascertained by Mr. Scovil, check within two-tenths of a foot.

The members of the party reported on the morning of May 18, and levelling operations were at once begun. As the levels were to begin from the middle of the city of Winnipeg it was not practicable to establish camp. The party, therefore, stopped at hotels until the levels were clear of the city. While levelling the central part of the city it was necessary to make use of the early hours of the morning, in order to avoid interference from the daily traffic. The afternoons were spent in levelling along the track, near the outskirts of the city.

Between Winnipeg and Portage la Prairie, a distance of fifty miles, the line runs through open prairie, and the work suffered much delay on account of high wind which prevailed day after day. It was also a source of trouble from Portage la Prairie to Gladstone, a distance of forty miles, although it was neither as strong nor as frequent. From Gladstone to the end of the line the track was for the greater part sheltered from the wind by timber. The summer of 1914 was remarkably dry for Manitoba, and the high temperature exceeded any that had been recorded for a number of years. Little or no time was lost through wet weather until the last month of field work, when several days were lost from this cause.

During this season a method of supplementary levelling was introduced to ensure against the occurrence of large errors. This was done by having the recorder make independent readings of the forward and backward rods at each instrument station, after I had completed the precise readings. His readings were recorded by me in a special book. He read only the middle wire, reading it to the nearest hundredth of a yard. These supplementary readings were made on the forward line only. At the end of every section of levelling, a comparison was made between the difference of elevation as shown by each book, special attention being paid to the sign of the difference of elevation.

This supplementary reading of the rod, and separate record, may be regarded as a semi-independent third line of levels run in conjunction with the regular duplicate forward and backward precise levels. It is not, of course, as good a check against error as an entirely independent line run by a different leveller at a different time, but it has proved very useful in quickly detecting a clerical error in the records which otherwise might not have been noticed until the books were checked in the office.

The progress of the levels suffered appreciably in taking the additional set of readings at each station. I think the retarding effect could safely be stated at ten miles a month of complete levels.



The permanent bench-marks between Winnipeg and Gladstone were established on foundations of buildings. Beyond Gladstone the country becomes more sparsely settled, and concrete pillars had to be made from there to the end of the line at Swan River. Pillars were also made along the branch from Sifton Junction to lake Winnipegosis.

The bench-mark established in foundations consists of a copper plug of a uniform diameter of three-quarters of an inch, and three and one-half inches long. A slit one-sixteenth inch deep is cut across the middle of one end. A hole seven-eighths inch diameter and three and three-quarter inches deep, is drilled in a sound part of the wall and filled with wet cement. The plug is pushed in until flush with the face of the wall, the excess cement being expelled. Before the cement has firmly set, the plug is turned on its axis and the slit made horizontal. This style of bench-mark can be made in fifteen minutes, and has firmly set in a few hours.

During the season seventy-seven permanent bench-marks were established; of these three were on bridge piers, twenty-five were on foundations of houses, and the remaining forty-nine were in concrete pillars.

Three permanent bench-marks were established on the branch from Delta Junction to lake Manitoba, but owing to the marshy nature of the lake shore no bench-mark of a permanent nature could be established closer than three miles to the lake.

One permanent bench-mark was established at lake Dauphin, and four were established on the branch to lake Winnipegosis, also one close to the lake shore for the convenience of the Hydrographic Survey.

The elevations of all the railway stations between Winnipeg and Swan River, amounting to a total of sixty, were recorded. In addition I determined the elevations of forty-eight streams and of thirty-three roads crossing the line of levels.

Several photographs of bench marks were taken in order to enable them to be more readily found in future. Photographs are undoubtedly of considerable value when used with the descriptions, as they show many useful details which can not be stated in a description. The accumulated discrepancy between the forward and backward measures showed no marked tendency to increase in a positive or negative direction. It passed through zero twenty-five times during the season. The greatest positive accumulation of any one place was + 0.048 foot at 168 miles and the greatest negative accumulation was — 0.119 foot at the end of 246 miles. The final total discrepancy at the end of the line (280 miles) was — 0.0054 foot. The partial discrepancy for a mile section was positive in forty-seven per cent, and negative in fifty-three per cent, of the total number of sections. The discrepancy exceeded 0.010 foot in only twenty-five per cent of the sections.

The probable error of the mean of a mile section is 0.0029 foot, and the probable error of the mean for the whole length of 280 miles of main line is 0.048 foot.

The line was completed to Swan River on October 17, exactly five months from the date the work was begun from Winnipeg. During this period, 321 miles of levels were run. This is at the average rate of sixty-four miles per month. The total mileage is distributed as follows:—

|  | Miles. |
|--|--------|
| Winnipeg to Swan River.. . . .               | 280    |
| Delta Junction to Lake Manitoba.. . . .      | 15     |
| Ochre River to Lake Dauphin.. . . .          | 5      |
| Sifton Junction to Lake Winnipegosis.. . . . | 21     |
|  | <hr/>  |
|  | 321    |

It should be remembered that in addition to the duplicate lines of levels a third approximate line was run by having the recorder make additional independent readings at each station.



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From October 19 to 22, I was engaged on miscellaneous levels between Swan River and Hudson Bay Junction. The party was paid off at Hudson Bay Junction on October 23, and I left on the following day for Calgary, arriving there on the night of the 26th.

## REPORT OF E. W. BERRY, D.L.S.

## LEVELS ALONG CANADIAN NORTHERN AND HUDSON BAY RAILWAYS.

*(To accompany report of J. N. Wallace, D.L.S.)*

The work carried out by me during the past season comprised the running of levels along the Canadian Northern and Hudson Bay railways from Hudson Bay Junction to a point ninety-nine miles northeasterly from Pas, and also a line from Prince Albert to Hudson Bay Junction. In addition certain miscellaneous work was carried out on the branch line to Big River. These totalled in all 371 miles, of which 100 miles were original levels, and the remainder single lines of levels over the work of previous seasons.

I left Calgary on August 6, 1914, and reached Prince Albert the next day. Having engaged men there and secured materials for bench-marks, I left on August 10 for Hudson Bay Junction, where I arrived the same day.

A single line of levels along the Canadian Northern railway from Hudson Bay Junction to Pas was commenced on the 11th. The line of railway runs through a country which is largely composed of spruce and tamarack swamps. In the swampy sections the track yields to the pressure of a train or handcar and recovers its original elevation very slowly. This makes levelling difficult. Many of the temporary bench-marks of the previous season's work had moved more than a tenth of a foot, and on this account I had to run twenty miles twice.

The party consisted of eight men, consisting of leveller, recorder, cook, bench-mark man, two rod men, umbrella man, and a pilot for the handcar. We camped in tents, moving twice a week by freight train. The usual move was two sidings, about fourteen miles. The weather was fine during August, but some days were lost in September on account of heavy rains.

The twelve permanent bench-marks established the year before were in good condition with two exceptions. I made three new permanent bench-marks, and recorded the elevations of all the railway stations and of four streams, which had not been determined in the original line.

The work was completed on September 12. A precise level line running northeasterly along the Hudson Bay railway towards Port Nelson, was then commenced. The total length of the Hudson Bay railway from Pas to Port Nelson is about 440 miles. At the end of October, 1914, steel had been laid for 165 miles. It is expected that trains will be running along this line to a point 220 miles from Pas by the spring of 1915. As the road bed was new it was difficult to get precise results. The first twenty miles are on firm ground, with the exception of a few miles in the vicinity of Little Frog lake. This portion of the line had also been ballasted for some months before levelling started. From here on, the condition of the track got steadily worse for precise levelling, because the construction work was farther from completion. The country traversed by the line also becomes more swampy as it proceeds. For many miles there was no ballast yet laid and I had to use either the track, resting on the original mossy surface, or the surface itself, to afford a basis for the turning points. Ballasting was in progress from the time the work was begun until October 23, and interruptions from gravel and material trains occurred nearly every half hour. About October 23 the ballasting was completed. After this, interruptions were confined to the passing of trains of supplies and materials going to the end of steel.



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Permanent bench-marks on concrete pillars were established at approximately the same distances apart as railway sidings. No bench-mark was placed within half a mile of any siding, and generally the distance between a siding and a bench-mark is from one to three miles. If bench-marks are placed close to sidings, they are liable to destruction when buildings are erected later. There are thirteen bench-marks or pillars, and two in the concrete foundations of railway tanks. For the first thirty miles, the usual temporary bench-mark, consisting of a railway spike in a telephone pole, was used. After this, the poles were found not to be firm enough for bench-marks, so marks cut in boulders and nails on stumps were used. Besides bench-marks the following elevations were recorded: base of rail at all sidings and bridges, and water level of streams and lakes crossed by the railway. Connection was made to bench-marks on the 15th, 16th and 17th base lines. The elevations of three streams and lakes were recorded, these being the only ones of any consequence crossed by the line.

The weather was rather unfavourable while this line was being run. High winds prevailed during most of September and October. There were some days lost on account of rain and heavy snow-storms. In some localities, also, the fog hangs low over swamp lands till late in the morning, making work impossible until it has disappeared.

For transport I depended on the trains of the Hudson Bay Construction company. For the accommodation of their workmen and the general public, the company ran trains about twice a week. Owing to the unfinished condition of the road-bed, however, no regular time-table was followed, and it was often impossible to find out within a day or two when a train would arrive. Trains left Pas at seven in the morning and generally reached the end of steel before midnight. On October 26 the train service stopped suddenly without notice (owing to a strike, as I subsequently learned); a heavy fall of snow made it impossible to use the hand car, as there were no trains running which would have cleared the track. Work was continued on foot until a permanent bench-mark was reached seven miles beyond our camp. On November 7, a train came down from Pas in charge of the Royal Northwest Mounted Police to bring out some parties farther down the line, who were short of provisions. Being unable to obtain any assurance that any more trains would be run during the winter, I arranged to have my outfit hauled back on this train, and returned to Pas on November 8.

Most of the party were paid off on our arrival at Pas. The outfit was shipped by freight to Prince Albert and on November 10, I left Pas arriving at Prince Albert the following day. A few days were then spent on office work until the camp outfit arrived from Pas. I then stored most of the outfit and arranged to re-level certain sections along the Canadian Northern railway line from Prince Albert to Big river. For this purpose I took two men with me, and hired a third man locally for a day or two when necessary. The sections which I re-levelled were scattered at intervals over the whole length of the line. A connection was also made from the end of the line at Big river to the levels of the 15th base line, using the water level of Cowan lake as a connecting link. This work was completed on December 1. We got board at a hotel at Shellbrook and at houses or stores in Canwood, Polwarth and Big River.

The next work undertaken was a second levelling of the line from Prince Albert to Hudson Bay Junction. This was commenced on December 5, 1914, and ended on January 20, 1915. The total distance is 162 miles. The party consisted of six men. We boarded at hotels until we passed Tisdale, and at lumber camps from Crooked river to Hudson Bay Junction. A single line was run through. Twenty-six sections of one mile each were, however, levelled twice because of disturbances of temporary bench-marks greater than 0.10 foot since the original levelling. These disturbances were found to be local, and did not affect the accuracy of the permanent bench-marks.



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This line of railway is in open country from Prince Albert to Tisdale, a distance of eighty-nine miles, but east of Tisdale the country is wooded. The trains did not run as often this winter as usual. There was an express train from Winnipeg to Prince Albert every second day, which returned the following day. On the days that the express train did not run, there was a mixed train from Prince Albert, which went only as far as Mistatim. Our baggage was shipped by freight on the mixed, or by express on the passenger train.

In the open country during the two weeks before Christmas, we were inconvenienced by low temperatures accompanied by high winds. Except for this, conditions generally were favourable. The days were cloudy, and the track being frozen solid no difficulty was met from shifting turning points.

On this line there is a permanent bench-mark on a concrete pillar at every railway station and siding, and many such pillars have been placed midway between stations. The pillar at Weldon was destroyed when an elevator was built. One of the pillars near Hudson Bay Junction was also damaged, and a new pillar to take its place was made this season. All the other permanent bench-marks on this line were in good condition. The elevations of forty-nine streams crossing the line, which had been omitted in the original levels, were recorded during this re-levelling.

On January 21, 1915, I returned to Prince Albert and on the 22nd, I went to Debden on the Big River line and re-levelled a mile section near there. Next day I returned to Prince Albert, and connected the levels of the line to Hudson Bay Junction to a bench-mark of the Grand Trunk Pacific railway. On January 25, having paid off the party, I left for Calgary, where I arrived next day.



## APPENDIX No. 61.

## ABSTRACT OF THE REPORT OF B. W. WAUGH, D.L.S.

## BASE LINE SURVEYS IN THE VICINITY OF THE LOWER NELSON RIVER, NORTHERN MANITOBA.

The route followed to reach the starting point of our survey at the northeast corner of tp. 80-9-E., was by steamer from Selkirk to Whiskey Jack portage, between Cross and Sipiwesk lakes, and from there by barge to Split lake and up Ripple river to our destination.

This district may now be more easily reached by the Hudson Bay railway. At the time of our survey the railway was built to within twenty miles of Manitou rapids in tp. 78-6-E.

Our main supplies for the season's work were cached at Manitou. These supplies were forwarded from time to time by canoes to different points along lower Nelson river.

During a season of high water a good canoe route from Split lake to Kettle rapids in tp. 85-19-E. is afforded by Landing river as far as tp. 81-11-E., across a short portage into Moosenose lake, thence down Moosetongue river to Butnau lake, down Butnau river to Cache lake, across a portage into Kettle river, and down this river to the Nelson. On account of the exceedingly low water this season we were compelled to freight by Nelson river, which, below Gull lake, is a hard and dangerous river to travel, the current there being very swift and the river containing many rapids.

During the winter we used dogs as a means of transportation. Our base of supplies was at Long Spruce rapids, on Nelson river, in tp. 85-20-E.

Work continued steadily on the line throughout the season, except for a few days in the latter part of January, when we had to wait for Nelson river to freeze over at its mouth and for favourable conditions for crossing. Owing to the tide and its numerous cross currents we were unable to take our levels across the river there with any degree of accuracy.

On February 3, having completed the 24th base line east to Hudson bay, we started homeward, travelling by dog trains to camp 33 of McMillan Bros., where we turned over our dogs and other transportation outfit to Mr. G. H. Herriot, D.L.S., and proceeded from there on McMillan's tote road to the end of the steel at camp 21, and thence on a construction train to Pas.

The country covered by our survey may be generally described as muskeg, with numerous open and tamarack swamps drained to a certain extent by Nelson river and its tributaries. The soil is decayed moss and black loam with the exception of a strip of land about a half mile wide, bordering on the Nelson, where the soil is clay and clay loam. The southern portion of the country is timbered with spruce and tamarack up to six inches in diameter, and of poor quality, but from the NE. cor. tp. 88-2-E. to Port Nelson the country is very lightly timbered with small burnt spruce, with occasional green spruce bluffs.

For the most part the surface is very level, though rough and hummocky in places, and no slopes of any extent occur except in the immediate vicinity of Nelson river.

This river from Split lake north varies in width from one-half to one and one-half miles, except at its mouth, where it gradually widens to seven or eight miles. The chief rapids along this portion of the river are: Birthday rapids, in tp. 84-12-E..



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with a drop of four feet; Gull rapids, in tp. 85-15-E., with a drop of seventy-five feet in three miles; Kettle rapids, in tp. 85-19-E., with a drop of about eighty feet; Long Spruce rapids, in tp. 85-20-E., with a drop of about seventy feet in a distance of seven miles; and Limestone rapids, which are a series of rapids from the mouth of Limestone river to Prairie point, a distance of about nine miles, with a drop of over one hundred and fifty feet. Along this portion of the river the ice, which piles up on the shores in the spring, is to be found there as late as August. The banks of the river are, for the most part, clay cut banks from forty to seventy-five feet high.

In sec. 33, tp. 80-11-E., our line crossed Landing river. The lower part of this stream is from five to ten chains in width, with no perceptible current. It has, however, two rapids which are passed by one portage. It is navigable by canoe at any season during open water. The upper part, on the other hand, is much narrower and very crooked, containing many rapids. It is navigable by canoe only during high water. The river empties into the southeastern arm of Split lake.

Gull lake in townships 84 and 85, ranges 13 and 14, is merely a widening of Nelson river, being about ten miles long and averaging one and one-half miles in width. The shores are for the most part high clay banks, but in some places they are low and swampy. There is quite a perceptible current in the lake causing bad sea in an easterly wind.

Butnau river, rising in Butnau lake, empties into the Nelson from the south in tp. 84-16-E. Its lower part has very low marshy banks, but the upper part has high banks (from which the river derives its name) fairly well wooded with good spruce up to eighteen inches in diameter. In high water it is good for canoeing.

Kettle river empties into the Nelson below Kettle rapids in tp. 85-19-E. It is about fifty feet wide and flows between clay banks from forty to fifty feet high, well wooded with spruce from six to eighteen inches in diameter. In low water it forms a very poor canoe route, being very swift and shallow, and necessitating many short portages, but in high water it is exceptionally good for down-stream travel. Kettle river was the first stream in which we found brook trout; they are very plentiful there and range from eight to eighteen inches in length.

Limestone river empties into the Nelson from the west just below the first Limestone rapid. It is about five chains in width with a current of from four to six miles per hour. Its banks are of clay from fifty to seventy-five feet high, wooded with scattered spruce and tamarack, up to eighteen inches in diameter, and occasional clumps of jackpine up to six inches in diameter. It has no rapids of note except at its mouth, but the current is so strong that in travelling up-stream by canoe tracking has to be resorted to. Rock sturgeon and trout are found near its mouth.

Weir river, rising in North Fishing lakes, is about 160 miles long and 150 feet wide, and empties into the Nelson from the west about thirty miles from its mouth. Its banks, on the upper portion are ten feet high, wooded with spruce and tamarack from six to eighteen inches in diameter. A tote road is now being cut along this river in order to haul the timber at North Fishing lakes and along its banks to Port Nelson. This appears to be the last river in which fresh-water fish are caught. The main catch is sucker with occasional trout, rock sturgeon, jackfish and whitefish. It forms a poor canoe route on account of its many rapids and its crookedness.

Roblin river and Cooper creek cross the Second meridian east in townships 91 and 92 respectively, and flowing in a northeasterly direction empty into a chain of small lakes. These lakes, viz.: Donald, Spence, Curtis, Fiddler, Dewar and numerous other smaller ones are said to contain jackfish, sucker and whitefish. They are bordered with thick spruce up to six inches in diameter of good quality. Roblin river flows from Spence lake of this group and paralleling Weir river, flows into the Nelson about eight miles below it. The river is about seventy feet wide with a strong current, but from the amount of water it carries it is improbable that it draws all the water from this chain of lakes. The banks of the river are low and timbered with spruce and tamarack from six to eighteen inches in diameter. The river is poor for canoeing.



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A small belt of timber of about one square mile was found in tp. 88-22-E. It consists of spruce of good quality up to eighteen inches in diameter. This belt of timber together with scattered spruce and tamarack up to eighteen inches in diameter along Roblin, Weir, Limestone, Kettle, and Butnau rivers comprises the only timber of value found in the country.

No traces of mineral were seen and the only rock noticed consisted of a few outcroppings of granite along Nelson river.

Hay is found in small quantities along the banks of some of the smaller creeks flowing into the Nelson in the neighbourhood of Gull lake and above Kettle rapids. Prairie point, on Nelson river at Last Limestone rapids, is said to contain sixty acres of good hay land.

A large amount of water-power is available at the larger rapids along the Nelson, but in most cases they would require a long intake.

If the country were drained and stripped of its moss in order to let the frost out of the ground it would then be suitable for agricultural purposes, but it is not suitable in its present condition. The Nelson and its tributaries afford good drainage facilities.

On account of the extraordinarily poor year for game, we saw very little of any kind, but in ordinary seasons caribou, moose, and bear are said to be plentiful. Fox, marten, otter and mink are the chief fur-bearing animals.

Sturgeon, whitefish, jackfish and trout are the most valuable fish of the district.

The climate of 1914 was extraordinary for this country. There was very little rainfall in the summer and a fine open fall followed. The winter was not extremely cold, although the thermometer stayed at 20 degrees below zero nearly all November, December and January. In February the thermometer seldom registered below zero, and in this month there was an average depth of eighteen inches of snow.



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## APPENDIX No. 62.

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.

Table I.—Declination Observations.

| Place.                    | Township. | Range. | Meridian. | Date.         | Declination. | Observer.        |
|---------------------------|-----------|--------|-----------|---------------|--------------|------------------|
| At NE. cor. sec. 24.....  | 45        | 1      | E.        | Aug. 3, '14   | 14 02 7      | A. M. Narraway.  |
| At " 12 .....             | 45        | 1      | "         | " 6, '14      | 13 38 9      | "                |
| 41 26 S.- " 25.....       | 46        | 1      | "         | July 3, '14   | 14 06 5      | "                |
| 41 99 S.- " 12 .....      | 46        | 1      | "         | " 11, '14     | 03 6         | "                |
| 2 25 E.- " 35.....        | 48        | 1      | "         | June 14, '14  | 13 57 0      | "                |
| 42 65 S.- " 36.....       | 48        | 1      | "         | " 16, '14     | 14 13 0      | "                |
| 69 34 E.- " 32.....       | 80        | 1      | "         | Nov. 15, '13  | 33 6         | B. W. Waugh.     |
| 27 08 E.- " 34.....       | 80        | 1      | "         | " 18, '13     | 23 5         | "                |
| 54 66 E.- " 36.....       | 80        | 1      | "         | " 21, '13     | 15 10 1      | "                |
| 40 00 E.- " 31.....       | 44        | 2      | "         | Aug. 10, '14  | 13 53 5      | A. M. Narraway.  |
| 60 00 E.- " 34.....       | 44        | 2      | "         | " 17, '14     | 46 8         | "                |
| 17 29 E.- " 31.....       | 48        | 2      | "         | July 17, '14  | 42 4         | "                |
| 47 00 E.- " 33 .....      | 48        | 2      | "         | " 20, '14     | 15 14 1      | "                |
| 51 19 E.-NW " 31.....     | 76        | 2      | "         | Feb. 3, '14   | 27 8         | B. W. Waugh.     |
| 45 00 E.-NE " 34 .....    | 80        | 2      | "         | Nov. 25, '13  | 16 31 7      | "                |
| 39 97 S.- " 1 .....       | 38        | 3      | "         | Oct. 9, '14   | 13 15 8      | A. M. Narraway.  |
| 43 04 S.- " 13 .....      | 39        | 3      | "         | " 2, '14      | 43 0         | "                |
| 8 84 S.- " 12.....        | 39        | 3      | "         | " 6, '14      | 12 23 2      | "                |
| 57 56 S.- " 1.....        | 41        | 3      | "         | Sept. 23, '14 | 12 54 4      | "                |
| 21 85 S.- " 25.....       | 41        | 3      | "         | " 20, '14     | 46 0         | "                |
| 40 00 E.- " 36 .....      | 44        | 3      | "         | Aug. 20, '14  | 13 10 3      | "                |
| 10 00 W.- " 35.....       | 44        | 3      | "         | " 25, '14     | 02 8         | "                |
| 2 00 S.- " 36.....        | 44        | 3      | "         | " 27, '14     | 25 7         | "                |
| 6 63 E.-NW " 31.....      | 80        | 3      | "         | Nov. 28, '13  | 15 54 7      | B. W. Waugh      |
| 10 11 E.-N.E " 34.....    | 76        | 4      | "         | Feb. 19, '14  | 17 39 7      | "                |
| 40 00 E.-NW " 32 .....    | 80        | 4      | "         | Dec. 7, '13   | 14 30 0      | "                |
| 7 00 E.-NE " 31.....      | 76        | 5      | "         | Feb. 23, '14  | 18 30 4      | "                |
| 68 30 E.- " 31.....       | 80        | 5      | "         | Dec. 13, '13  | 13 37 4      | "                |
| 2 39 E.- " 33 .....       | 76        | 6      | "         | Feb. 28, '14  | 13 13 3      | "                |
| 57 52 E.- " 35.....       | 80        | 6      | "         | Dec. 27, '13  | 10 33 4      | "                |
| *33 87 E.- " 31 .....     | 81        | 7      | "         | " 31, '13     | 12 14 5      | "                |
| 41 87 E.-NW " 31.....     | 80        | 9      | "         | Jan. 14, '14  | 13 27 2      | "                |
| 47 55 E.-NE " 34.....     | 80        | 9      | "         | " 20, '14     | 14 16 1      | "                |
| At " 31 .....             | 11        | 10     | "         | Oct. 17, '14  | 10 56 4      | C. F. Aylsworth. |
| 24 00 W.- " 8.....        | 12        | 10     | "         | " 23, '14     | 12 05 3      | "                |
| 60 00 E.-NW " 18 .....    | 12        | 10     | "         | " 24, '14     | 11 1         | "                |
| At NE " 18.....           | 12        | 10     | "         | " 27, '14     | 11 28 8      | "                |
| 64 00 W " 30.....         | 12        | 10     | "         | " 27, '14     | 12 03 2      | "                |
| At " 30.....              | 12        | 10     | "         | " 27, '14     | 11 38 4      | "                |
| At SW " 18.....           | 12        | 10     | "         | " 29, '14     | 13 32 8      | "                |
| 50 00 N.-NE " 6.....      | 12        | 10     | "         | " 29, '14     | 14 1         | "                |
| At NW " 19.....           | 12        | 10     | "         | " 29, '14     | 11 11 4      | "                |
| 2 89 E.-NE " 31.....      | 20        | 10     | "         | May 20, '14   | 11 9         | A. M. Narraway.  |
| 7 30 E.- " 34.....        | 20        | 10     | "         | " 25, '14     | 19 6         | "                |
| 56 57 E.- " 35.....       | 20        | 10     | "         | " 26, '14     | 14 5         | "                |
| 26 00 E.- " 31.....       | 13        | 11     | "         | Sept. 10, '14 | 10 19 4      | C. F. Aylsworth. |
| 17 00 S.- " 31.....       | 14        | 11     | "         | Aug. 31, '14  | 9 49 8       | "                |
| 7 00 E.- " 31.....        | 14        | 11     | "         | " 31, '14     | 54 8         | "                |
| 42 00 E.- " 31.....       | 14        | 11     | "         | " 31, '14     | 10 11 3      | "                |
| At " 8.....               | 14        | 11     | "         | Sept. 28, '14 | 9 31 0       | "                |
| 30 00 S.- " 9.....        | 14        | 11     | "         | " 29, '14     | 35 6         | "                |
| 25 00 N.-SE " 4.....      | 14        | 11     | "         | " 29, '14     | 10 24 2      | "                |
| At N.E. cor. sec. 36..... | 48        | 1      | Pr.       | June 8, '14   | 14 04 0      | A. M. Narraway.  |
| 46 34 N.- " 24.....       | 72        | 1      | "         | " 11, '13     | 24 0         | B. W. Waugh.     |
| 57 51 N.- " 25.....       | 72        | 1      | "         | " 13, '13     | 15 06 2      | "                |



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RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place                    | Township. | Range. | Meridian. | Date.         | Declination. | Observer.        |
|--------------------------|-----------|--------|-----------|---------------|--------------|------------------|
| 52°12' N.-E. cor. sec. 1 | 73        | 1      | Pr.       | June 16, '13  | 16 31.6      | B. W. Waugh.     |
| 19°48' N.                | 73        | 1      | "         | " 17, '13     | 17 23.7      | "                |
| 63°33' N.                | 73        | 1      | "         | " 18, '13     | 18 05.6      | "                |
| 72°55' N.                | 73        | 1      | "         | " 19, '13     | 16 34.4      | "                |
| 47°50' N.                | 73        | 1      | "         | " 21, '13     | 15 49.9      | "                |
| 45°68' N.                | 74        | 1      | "         | " 23, '13     | 14 29.6      | "                |
| 7°36' N.                 | 74        | 1      | "         | " 24, '13     | 18.9         | "                |
| 64°76' N.                | 74        | 1      | "         | " 26, '13     | 17.5         | "                |
| 59°48' N.                | 74        | 1      | "         | " 27, '13     | 15 02.5      | "                |
| 37°55' N.                | 74        | 1      | "         | " 28, '13     | 01.7         | "                |
| 7°61' N.-SE.             | 75        | 1      | "         | July 1, '13   | 13 08.6      | "                |
| 63°64' N.                | 75        | 1      | "         | " 3, '13      | 16 41.5      | "                |
| 39°53' N.-NE.            | 75        | 1      | "         | " 4, '13      | 11 54.5      | "                |
| 39°00' N.                | 75        | 1      | "         | " 5, '13      | 15 06.2      | "                |
| 21°59' N.                | 75        | 1      | "         | " 7, '13      | 16 18.7      | "                |
| 40°20' N.                | 75        | 1      | "         | " 8, '13      | 11.5         | "                |
| 37°67' N.                | 75        | 1      | "         | " 9, '13      | 13 10.9      | "                |
| 9°81' N.                 | 75        | 1      | "         | " 10, '13     | 15 08.0      | "                |
| 19°21' N.                | 75        | 1      | "         | " 12, '13     | 17 24.0      | "                |
| 47°51' N.                | 75        | 1      | "         | " 14, '13     | 15 52.9      | "                |
| 49°84' N.                | 76        | 1      | "         | " 17, '13     | 16 36.4      | "                |
| 57°62' N.                | 76        | 1      | "         | " 19, '13     | 56.9         | "                |
| 50°10' E.                | 76        | 1      | "         | " 23, '13     | 15 34.4      | "                |
| 2°05' N.                 | 77        | 1      | "         | " 21, '13     | 18 13.6      | "                |
| 65°45' N.                | 77        | 1      | "         | " 24, '13     | 16 08.1      | "                |
| 35°91' N.                | 78        | 1      | "         | Aug. 1, '13   | 17 58.3      | "                |
| 16°03' N.                | 78        | 1      | "         | " 2, '13      | 16 31.7      | "                |
| 45°72' N.                | 78        | 1      | "         | " 4, '13      | 15 49.8      | "                |
| 79°43' N.                | 79        | 1      | "         | " 14, '13     | 15 19.3      | "                |
| 35°83' N.                | 80        | 1      | "         | " 21, '13     | 23.9         | "                |
| 15°00' E.                | 14        | 2      | "         | July 4, '14   | 12 17.3      | R. C. Purser.    |
| At                       | 14        | 2      | "         | " 7, '14      | 18.8         | "                |
| 20°00' E.                | 14        | 2      | "         | " 7, '14      | 35.0         | "                |
| 52°47' W.                | 76        | 2      | "         | Mar. 19, '14  | 14 58.6      | B. W. Waugh.     |
| 5°00' N.-SE.             | 15        | 3      | "         | Nov. 10, '14  | 12 18.1      | R. C. Purser.    |
| 20°00' N.-NE.            | 15        | 3      | "         | " 10, '14     | 22.6         | "                |
| 70°00' N.                | 22        | 3      | "         | May 27, '14   | 13 57.4      | C. F. Aylsworth. |
| 20°50' N.                | 22        | 3      | "         | June 2, '14   | 22.2         | "                |
| At                       | 22        | 3      | "         | " 12, '14     | 00.5         | "                |
| At                       | 22        | 3      | "         | " 20, '14     | 14.0         | "                |
| At                       | 22        | 3      | "         | " 24, '14     | 12 32.0      | "                |
| 12°00' E.                | 22        | 3      | "         | July 4, '14   | 13 14.3      | "                |
| 30°00' W.                | 22        | 3      | "         | " 6, '14      | 17.4         | "                |
| 50°00' E.                | 22        | 3      | "         | " 14, '14     | 10.4         | "                |
| At                       | 22        | 3      | "         | " 15, '14     | 03.3         | "                |
| At                       | 22        | 3      | "         | " 17, '14     | 26.1         | "                |
| 30°00' E.                | 22        | 3      | "         | " 18, '14     | 27.4         | "                |
| At                       | 22        | 3      | "         | " 21, '14     | 30.5         | "                |
| 80°89' W.                | 76        | 3      | "         | Mar. 24, '14  | 17 24.0      | B. W. Waugh.     |
| 40°00' E.                | 22        | 4      | "         | May 27, '14   | 13 40.7      | C. F. Aylsworth. |
| 8°00' N.                 | 22        | 4      | "         | Jun. 23, '14  | 12 44.9      | "                |
| 40°06' W.                | 23        | 5      | "         | May 20, '14   | 13 38.7      | "                |
| 27°00' E.                | 23        | 5      | "         | " 20, '14     | 12 52.6      | "                |
| 40°00' E.                | 23        | 5      | "         | " 20, '14     | 13 40.1      | "                |
| 32°00' N.                | 69        | 7      | "         | Sept. 18, '14 | 15 52.0      | P. E. Palmer.    |
| 41°00' N.                | 69        | 7      | "         | " 21, '14     | 14 08.0      | "                |
| 20°00' N.                | 69        | 7      | "         | " 24, '14     | 15 05.8      | "                |
| 37°00' E.                | 69        | 7      | "         | " 28, '14     | 36.9         | "                |
| 30°00' N.                | 69        | 7      | "         | Sept. 29, '14 | 16 08.9      | "                |
| 50°00' N.                | 69        | 7      | "         | " 30, '14     | 14 30.5      | "                |
| 30°00' E.                | 69        | 7      | "         | Oct. 12, '14  | 15 31.7      | "                |
| 36°00' N.                | 69        | 7      | "         | " 14, '14     | 14 56.9      | "                |
| 6°00' S.                 | 69        | 7      | "         | " 16, '14     | 15 14.9      | "                |
| 56°00' E.                | 69        | 7      | "         | " 20, '14     | 03.6         | "                |



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*

Table I.—Declination Observations.—Continued.

| Place.                          | Township. | Range. | Meridian. | Date.         | Declination | Observer.       |
|---------------------------------|-----------|--------|-----------|---------------|-------------|-----------------|
| 24° 00' S.-NE cor. sec. 35..... | 68        | 8      | Pr.       | Sept. 22, '14 | 14 33 8     | P. E. Palmer.   |
| 37° 00' S.-" 30.....            | 68        | 8      | "         | Oct. 30, '14  | 16 04 4     | "               |
| 56° 00' W.-" 19.....            | 68        | 8      | "         | Nov. 5, '14   | 25 7        | "               |
| 10° 00' E.-" 20.....            | 68        | 8      | "         | " 6, '14      | 15 24 2     | "               |
| 14° 00' N.-" 17.....            | 68        | 8      | "         | " 7, '14      | 11 8        | "               |
| 48° 00' E.-" 11.....            | 69        | 8      | "         | Sept. 15, '14 | 14 45 3     | "               |
| 44° 00' E.-" 10.....            | 69        | 8      | "         | " 16, '14     | 15 55 9     | "               |
| 20° 00' N.-" 25.....            | 69        | 8      | "         | Oct. 2, '14   | 15 44 6     | "               |
| 16° 00' W.-" 11.....            | 69        | 8      | "         | Nov. 20, '14  | 01 3        | "               |
| 43° 00' S.-" 33.....            | 67        | 9      | "         | Dec. 8, '14   | 14 35 5     | "               |
| 25° 00' W.-" 20.....            | 67        | 9      | "         | " 14, '14     | 15 04 7     | "               |
| 6° 00' N.-" 8.....              | 67        | 9      | "         | " 16, '14     | 13 38 1     | "               |
| 12° 00' N.-" 9.....             | 67        | 9      | "         | " 17, '14     | 14 53 7     | "               |
| 48° 00' W.-" 7.....             | 67        | 9      | "         | " 19, '14     | 18 20 5     | "               |
| 39° 00' S.-" 6.....             | 67        | 9      | "         | " 28, '14     | 12 53 8     | "               |
| 10° 00' W.-" 33.....            | 67        | 9      | "         | Nov. 28, '14  | 13 07 5     | "               |
| 24° 00' S.-" 25.....            | 68        | 9      | "         | " 16, '14     | 15 34 9     | "               |
| 60° 00' W.-" 24.....            | 68        | 9      | "         | " 17, '14     | 04 1        | "               |
| 20° 00' N.-" 12.....            | 68        | 9      | "         | " 19, '14     | 38 3        | "               |
| At " 36.....                    | 68        | 9      | "         | " 23, '14     | 35 7        | "               |
| 15° 00' N.-" 11.....            | 68        | 9      | "         | " 30, '14     | 13 47 1     | "               |
| 12° 00' S.-" 23.....            | 68        | 9      | "         | Dec. 1, '14   | 14 40 8     | "               |
| 5° 00' S.-" 9.....              | 67        | 10     | "         | " 29, '14     | 13 46 9     | "               |
| 28° 66' W.-" 36.....            | 4         | 11     | "         | June 29, '13  | 13 20 0     | A. G. Stuart.   |
| 28° 66' W.-" 36.....            | 4         | 11     | "         | " 29, '13     | 20 5        | "               |
| 24° 00' W.-" 32.....            | 65        | 11     | "         | Aug. 19, '14  | 16 21 5     | P. E. Palmer.   |
| 28° 00' E.-" 32.....            | 65        | 11     | "         | " 26, '14     | 14 57 0     | "               |
| 60° 00' N.-" 12.....            | 65        | 11     | "         | " 22, '14     | 19 26 7     | "               |
| 20° 00' N.-" 18.....            | 65        | 11     | "         | " 28, '14     | 16 17 9     | "               |
| 17° 00' E.-" 7.....             | 65        | 11     | "         | " 30, '14     | 15 45 3     | "               |
| 20° 00' W.-" 19.....            | 65        | 11     | "         | " 31, '14     | 57 0        | "               |
| 30° 00' E.-" 22.....            | 65        | 11     | "         | Sept. 5, '14  | 20 39 5     | "               |
| 60° 00' E.-" 22.....            | 65        | 11     | "         | " 7, '14      | 22 17 6     | "               |
| 20° 00' E.-" 12.....            | 66        | 11     | "         | " 10, '14     | 18 05 8     | "               |
| 12° 00' S.-" 18.....            | 65        | 12     | "         | July 17, '14  | 16 54 1     | "               |
| 21° 00' W.-" 11.....            | 65        | 12     | "         | Aug. 3, '14   | 01 9        | "               |
| 25° 00' N.-" 1.....             | 65        | 12     | "         | " 4, '14      | 15 47 5     | "               |
| 40° 00' N.-" 12.....            | 65        | 12     | "         | " 6, '14      | 54 5        | "               |
| 8° 00' E.-" 22.....             | 65        | 12     | "         | " 7, '14      | 17 42 3     | "               |
| 50° 00' N.-" 27.....            | 65        | 12     | "         | " 10, '14     | 15 6        | "               |
| 56° 00' N.-" 14.....            | 65        | 12     | "         | " 11, '14     | 16 53 3     | "               |
| 30° 00' E.-" 23.....            | 65        | 12     | "         | " 13, '14     | 58 9        | "               |
| 40° 00' N.-" 24.....            | 65        | 12     | "         | " 14, '14     | 17 51 5     | "               |
| 50° 00' N.-" 26.....            | 65        | 12     | "         | " 15, '14     | 18 42 1     | "               |
| 10° 00' E.-" 33.....            | 65        | 12     | "         | " 17, '14     | 19 39 0     | "               |
| 45° 00' N.-" 31.....            | 48        | 13     | "         | June 13, '14  | 16 24 2     | T. H. Plunkett. |
| 29° 50' S.-" 36.....            | 51        | 13     | "         | May 29, '14   | 20 0        | "               |
| 55° 00' S.-" 25.....            | 51        | 13     | "         | " 31, '14     | 18 4        | "               |
| At " 34.....                    | 52        | 13     | "         | " 23, '14     | 28 5        | "               |
| 41° 00' E.-" 36.....            | 52        | 13     | "         | " 22, '14     | 20 8        | "               |
| 9° 45' S.-" 1.....              | 52        | 13     | "         | " 28, '14     | 26 0        | "               |
| 40° 00' S.-" 24.....            | 52        | 13     | "         | " 26, '14     | 28 9        | "               |
| At " 11.....                    | 65        | 13     | "         | July 7, '14   | 14 04 9     | P. E. Palmer.   |
| 25° 00' N.-NE cor. sec. 3.....  | 65        | 13     | "         | July 8, '14   | 19 11 2     | "               |
| 61° 50' E.-" 32.....            | 52        | 14     | "         | May 6, '14    | 17 10 4     | T. H. Plunkett. |
| 64° 66' E.-" 33.....            | 52        | 14     | "         | " 8, '14      | 16 44 9     | "               |
| 19° 22' E.-" 36.....            | 52        | 14     | "         | " 11, '14     | 45 7        | "               |
| 65° 30' W.-" 36.....            | 68        | 14     | "         | Dec. 15, '13  | 11 03 6     | G. H. Herriot.  |
| 45° 00' W.-" 34.....            | 68        | 14     | "         | " 17, '13     | 17 45 9     | "               |
| 30° 00' E.-" 31.....            | 52        | 15     | "         | April 26, '14 | 16 40 2     | T. H. Plunkett. |
| 5° 00' E.-" 32.....             | 52        | 15     | "         | " 27, '14     | 35 0        | "               |
| 40° 00' E.-" 32.....            | 52        | 15     | "         | " 28, '14     | 34 9        | "               |
| 73° 00' E.-" 32.....            | 52        | 15     | "         | " 28, '14     | 37 7        | "               |
| 39° 00' E.-" 33.....            | 52        | 15     | "         | " 29, '14     | 37 5        | "               |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                |         |    | Township. | Range. | Meridian.     | Date.   | Declination. | Observer.       |
|-----------------------|---------|----|-----------|--------|---------------|---------|--------------|-----------------|
|                       |         |    |           |        |               |         | °            |                 |
| 16 00 E.-NE cor. sec. | 34..... | 52 | 15        | Pr.    | April 30, '14 | 19 8    |              | T. H. Plunkett. |
| 30 00 E.-             | 36..... | 52 | 15        | "      | May 1, '14    | 22 2    |              | "               |
| 49 60 E.-             | 36..... | 52 | 15        | "      | " 3, '14      | 25 9    |              | "               |
| 42 47 E.-             | 34..... | 48 | 16        | "      | Mar. 22, '14  | 17 52 5 |              | "               |
| At                    | 35..... | 63 | 16        | "      | Sept, 23, '14 | 59 3    |              | J. S. Galletly. |
| 10 00 E.-             | 23..... | 63 | 16        | "      | " 24, '14     | 18 03 8 |              | "               |
| 60 00 W.-             | 23..... | 63 | 16        | "      | " 28, '14     | 69 3    |              | "               |
| 20 00 S.-             | 25..... | 64 | 16        | "      | Aug. 27, '14  | 12 7    |              | "               |
| 5 00 N.-              | 2.....  | 64 | 16        | "      | Sept. 18, '14 | 33 2    |              | "               |
| 20 00 E.-             | 11..... | 64 | 16        | "      | " 21, '14     | 17 36 8 |              | "               |
| 51 00 E.-             | 36..... | 48 | 18        | "      | Mar. 17, '14  | 28 9    |              | T. H. Plunkett. |
| 16 00 E.-             | 33..... | 52 | 18        | "      | Jan. 22, '14  | 16 27 4 |              | "               |
| 60 00 E.-             | 36..... | 52 | 18        | "      | " 27, '14     | 21 1    |              | "               |
| 50 25 E.-             | 32..... | 19 | 19        | "      | April 28, '14 | 15 00 7 |              | S. L. Evans.    |
| 2 42 E.-              | 35..... | 52 | 19        | "      | Jan. 20, '14  | 59 1    |              | T. H. Plunkett. |
| 15 00 S.-             | 30..... | 61 | 19        | "      | Dec. 31, '14  | 18 19 0 |              | J. S. Galletly. |
| 43 50 E.-             | 32..... | 52 | 20        | "      | Jan. 5, '14   | 17 38 3 |              | T. H. Plunkett. |
| 56 00 E.-             | 34..... | 52 | 20        | "      | " 9, '14      | 50 4    |              | "               |
| 2 00 S.-              | 22..... | 61 | 20        | "      | Dec. 12, '13  | 57 1    |              | P. B. Street.   |
| 4 00 N.-              | 16..... | 61 | 20        | "      | " 13, '13     | 18 05 1 |              | "               |
| 61 63 E.-             | 31..... | 52 | 21        | "      | " 29, '13     | 17 17 1 |              | T. H. Plunkett. |
| 20 00 N.-             | 27..... | 60 | 21        | "      | Oct. 31, '13  | 56 7    |              | P. B. Street.   |
| 16 00 N.-             | 20..... | 60 | 21        | "      | Dec. 18, '13  | 42 8    |              | "               |
| 30 00 N.-             | 11..... | 61 | 21        | "      | Nov. 16, '13  | 18 06 6 |              | "               |
| 52 00 N.-             | 3.....  | 61 | 21        | "      | " 21, '13     | 17 34 1 |              | "               |
| 4 00 S.-              | 5.....  | 61 | 21        | "      | Dec. 17, '13  | 55 3    |              | "               |
| 6 77 E.-              | 34..... | 48 | 22        | "      | Feb. 26, '14  | 57 2    |              | T. H. Plunkett. |
| 41 50 E.-             | 34..... | 52 | 22        | "      | Dec. 24, '13  | 17 2    |              | "               |
| 22 00 N.-             | 17..... | 59 | 22        | "      | Feb. 15, '14  | 18 00 5 |              | P. B. Street.   |
| 21 00 N.-             | 3.....  | 60 | 22        | "      | Jan. 15, '14  | 17 47 3 |              | "               |
| 18 00 N.-             | 9.....  | 60 | 22        | "      | " 22, '14     | 18 07 8 |              | "               |
| 46 95 E.-             | 34..... | 52 | 23        | "      | Dec. 20, '13  | 17 25 6 |              | T. H. Plunkett. |
| 42 00 N.-             | 20..... | 58 | 23        | "      | April 5, '14  | 18 07 8 |              | P. B. Street.   |
| 44 00 N.-             | 18..... | 58 | 23        | "      | " 27, '14     | 21 4    |              | "               |
| 20 00 S.-             | 33..... | 58 | 23        | "      | May 8, '14    | 43 3    |              | "               |
| 27 29 E.-             | 33..... | 52 | 24        | "      | Dec. 11, '13  | 36 3    |              | T. H. Plunkett. |
| 61 21 E.-             | 36..... | 52 | 24        | "      | " 15, '13     | 17 27 7 |              | "               |
| 25 00 S.-             | 29..... | 57 | 24        | "      | Mar. 12, '14  | 47 7    |              | P. B. Street.   |
| 58 00 N.-             | 33..... | 57 | 24        | "      | " 13, '14     | 18 11 9 |              | "               |
| 40 00 N.-             | 6.....  | 61 | 24        | "      | Dec. 3, '14   | 17 28 9 |              | J. S. Galletly. |
| 40 00 N.-             | 7.....  | 61 | 24        | "      | " 4, '14      | 18 00 9 |              | "               |
| 50 00 N.-             | 18..... | 61 | 24        | "      | " 4, '14      | 17 52 9 |              | "               |
| At                    | 4.....  | 61 | 24        | "      | " 6, '14      | 18 14 7 |              | "               |
| 35 00 N.-             | 16..... | 61 | 24        | "      | " 6, '14      | 03 5    |              | "               |
| 36 00 E.-             | 34..... | 52 | 25        | "      | " 8, '13      | 16 55 9 |              | T. H. Plunkett. |
| At                    | 31..... | 52 | 26        | "      | Nov. 25, '13  | 17 37 8 |              | "               |
| 5 29 E.-              | 36..... | 52 | 26        | "      | Dec. 1, '13   | 18 55 0 |              | "               |
| 30 00 W.-             | 21..... | 54 | 26        | "      | Oct. 1, '13   | 19 00 0 |              | P. B. Street.   |
| 5 00 N.-              | 18..... | 54 | 26        | "      | Oct. 4, '13   | 02 8    |              | "               |
| At                    | 20..... | 54 | 26        | "      | " 5, '13      | 18 29 9 |              | "               |
| At                    | 20..... | 54 | 26        | "      | " 5, '13      | 34 0    |              | "               |
| 6 00 N.-              | 27..... | 9  | 27        | "      | July 27, '14  | 16 10 4 |              | R. C. Purser.   |
| 65 83 E.-             | 31..... | 48 | 27        | "      | Sept. 7, '13  | 17 43 6 |              | T. H. Plunkett. |
| 32 72 E.-             | 36..... | 48 | 27        | "      | " 11, '13     | 18 11 4 |              | "               |
| 20 00 N.-             | 20..... | 53 | 27        | "      | Aug. 28, '13  | 20 01 8 |              | P. B. Street.   |
| 47 00 N.-             | 3.....  | 54 | 27        | "      | " 4, '13      | 18 14 3 |              | "               |
| 55 00 N.-             | 11..... | 54 | 27        | "      | Sept. 5, '13  | 19 03 3 |              | "               |
| At                    | 35..... | 55 | 27        | "      | Oct. 21, '14  | 18 22 5 |              | J. S. Galletly. |
| At                    | 34..... | 55 | 27        | "      | " 23, '14     | 30 3    |              | "               |
| 40 00 W.-             | 33..... | 55 | 27        | "      | " 24, '14     | 21 1    |              | "               |
| 55 00 N.-             | 35..... | 55 | 27        | "      | " 29, '14     | 19 18 3 |              | "               |
| 45 00 W.-             | 31..... | 56 | 27        | "      | " 7, '14      | 24 5    |              | "               |
| 60 00 S.-             | 28..... | 56 | 27        | "      | " 8, '14      | 16 04 4 |              | "               |
| 40 00 N.-             | 20..... | 56 | 27        | "      | " 13, '14     | 17 51 1 |              | "               |



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place.                |               |    | Township. | Range. | Meridian. | Date.        | Declination. | Observer.         |
|-----------------------|---------------|----|-----------|--------|-----------|--------------|--------------|-------------------|
| At                    | NE. cor. sec. | 21 | 56        | 27     | Pr.       | Oct. 14, '14 | 14 50.9      | J. S. Galletly.   |
| At                    | "             | 28 | 56        | 27     | "         | " 15, '14    | 17 47.0      | "                 |
| At                    | "             | 27 | 56        | 27     | "         | " 16, '14    | 18 29.0      | "                 |
| At                    | "             | 23 | 56        | 27     | "         | " 26, '14    | 30.8         | "                 |
| 30 00 W.-             | "             | 10 | 56        | 27     | "         | " 31, '14    | 17 27.5      | "                 |
| 68 24 E.-             | "             | 36 | 52        | 28     | "         | Nov. 19, '13 | 19 17.7      | T. H. Plunkett.   |
| At                    | "             | 12 | 49        | 30     | "         | Jan. 31, '14 | 19 18.8      | P. E. Palmer.     |
| At                    | "             | 20 | 50        | 30     | "         | Mar. 12, '14 | 18 20.9      | "                 |
| At                    | SE            | 5  | 51        | 30     | "         | Feb. 23, '14 | 17 21.2      | "                 |
| 20.00 N.-             | "             | 5  | 51        | 30     | "         | " 24, '14    | 16 20.2      | "                 |
| At                    | "             | 1  | 51        | 30     | "         | " 5, '14     | 17 35.6      | "                 |
| At                    | NE.           | 12 | 5         | 31     | "         | Sept. 4, '13 | 16 45.1      | A. G. Stuart.     |
| At                    | "             | 12 | 5         | 31     | "         | " 4, '13     | 39.1         | "                 |
| At                    | "             | 12 | 5         | 31     | "         | " 4, '13     | 16 36.6      | "                 |
| At                    | "             | 12 | 5         | 31     | "         | " 4, '13     | 41.6         | "                 |
| 16 35 S.-             | "             | 12 | 6         | 31     | "         | " 7, '13     | 00.2         | "                 |
| 16 35 S.-             | "             | 12 | 6         | 31     | "         | " 7, '13     | 15 57.7      | "                 |
| At                    | "             | 1  | 8         | 31     | "         | " 10, '13    | 29.7         | "                 |
| At                    | "             | 1  | 8         | 31     | "         | " 10, '13    | 34.6         | "                 |
| At                    | E. Bdy. sec.  | 1  | 9         | 31     | "         | " 12, '13    | 21.2         | "                 |
| 8 09 S.-NE. cor. sec. | 36            | 10 | 31        | "      | "         | " 16, '13    | 16 00.1      | "                 |
| 8 09 S.-              | "             | 36 | 10        | 31     | "         | " 16, '13    | 00.7         | "                 |
| At                    | "             | 29 | 21        | 31     | "         | June 16, '14 | 18 10.0      | R. C. Purser.     |
| 40 00 E.-             | "             | 29 | 21        | 31     | "         | " 16, '14    | 17 59.9      | "                 |
| 20 00 W.-             | "             | 36 | 50        | 31     | "         | Jan. 16, '14 | 16 42.4      | P. E. Palmer.     |
| 96 00 W.-             | "             | 36 | 50        | 31     | "         | " 17, '14    | 17 21.2      | "                 |
| 56 75 W.-             | "             | 32 | 4         | 1      | 2         | June 12, '14 | 16 16.3      | A. G. Stuart.     |
| 36 00 N.-             | "             | 32 | 48        | 1      | 2         | " 18, '13    | 19 09.4      | P. E. Palmer.     |
| 36 00 N.-             | "             | 32 | 48        | 1      | 2         | " 24, '13    | 07.4         | "                 |
| 40 00 S.-             | "             | 28 | 48        | 1      | 2         | July 2, '13  | 24.8         | "                 |
| 61 64 S.-             | "             | 18 | 48        | 1      | 2         | Aug. 18, '13 | 43.5         | "                 |
| 22 52 W.-             | "             | 8  | 48        | 1      | 2         | " 20, '13    | 20 30.5      | "                 |
| 22 17 S.-             | "             | 6  | 48        | 1      | 2         | " 21, '13    | 19 44.8      | "                 |
| At                    | NE.           | 8  | 49        | 1      | 2         | June 26, '13 | 46.0         | "                 |
| 6 35 N.-              | "             | 3  | 50        | 1      | 2         | Aug. 11, '13 | 07.2         | "                 |
| 22 00 E.-             | "             | 11 | 50        | 1      | 2         | " 12, '13    | 15.0         | "                 |
| 16 40 E.-             | "             | 31 | 60        | 1      | 2         | June 9, '14  | 20 27.4      | E. S. Martindale. |
| 22 50 E.-             | "             | 33 | 60        | 1      | 2         | " 10, '14    | 19 20.3      | "                 |
| 8 00 N.-              | "             | 13 | 68        | 1      | 2         | Jan. 6, '13  | 20 20.0      | E. W. Robinson.   |
| 33 00 N.-             | "             | 25 | 68        | 1      | 2         | " 18, '13    | 19 35.0      | "                 |
| 58 57 N.-             | "             | 1  | 69        | 1      | 2         | " 21, '13    | 20 11.9      | "                 |
| 63 35 N.-             | "             | 12 | 69        | 1      | 2         | " 22, '13    | 27.6         | "                 |
| 20 55 N.-             | "             | 24 | 69        | 1      | 2         | " 24, '13    | 19 50.0      | "                 |
| 41 22 N.-             | "             | 25 | 69        | 1      | 2         | " 25, '13    | 20 21.7      | "                 |
| 13 16 N.-             | "             | 1  | 70        | 1      | 2         | Feb. 4, '13  | 20 32.7      | "                 |
| 49 66 N.-             | "             | 1  | 70        | 1      | 2         | " 5, '13     | 41.8         | "                 |
| 37 77 N.-             | "             | 12 | 70        | 1      | 2         | " 6, '13     | 21 01.8      | "                 |
| 31 75 N.-             | "             | 25 | 70        | 1      | 2         | " 8, '13     | 19 31.6      | "                 |
| 14 17 N.-             | "             | 36 | 70        | 1      | 2         | " 10, '13    | 21 22.3      | "                 |
| 67 24 N.-             | "             | 36 | 70        | 1      | 2         | " 11, '13    | 18 50.0      | "                 |
| 61 39 N.-             | "             | 13 | 71        | 1      | 2         | " 15, '13    | 20 15.2      | "                 |
| 41 97 N.-             | "             | 24 | 71        | 1      | 2         | " 17, '13    | 30.9         | "                 |
| 8 55 N.-              | "             | 25 | 71        | 1      | 2         | " 18, '13    | 21 30.1      | "                 |
| 64 03 N.-             | "             | 25 | 71        | 1      | 2         | " 19, '13    | 47.1         | "                 |
| 12 34 N.-             | "             | 1  | 72        | 1      | 2         | " 21, '13    | 20 16.2      | "                 |
| 22 96 N.-             | "             | 12 | 72        | 1      | 2         | " 22, '13    | 22 50.5      | "                 |
| 78 16 N.-             | "             | 12 | 72        | 1      | 2         | " 24, '13    | 20 15.5      | "                 |
| 42 14 N.-             | "             | 24 | 72        | 1      | 2         | " 25, '13    | 23 39.5      | "                 |
| 7 67 N.-              | "             | 25 | 72        | 1      | 2         | " 27, '13    | 20 41.7      | "                 |
| 12 94 N.-             | "             | 36 | 72        | 1      | 2         | " 28, '13    | 21 56.0      | "                 |
| 55 75 N.-             | "             | 13 | 73        | 1      | 2         | Mar. 3, '13  | 22 43.3      | "                 |
| 27 59 N.-             | "             | 25 | 73        | 1      | 2         | " 4, '13     | 15.0         | "                 |
| 76 97 N.-             | "             | 36 | 73        | 1      | 2         | " 6, '13     | 23 52.1      | "                 |
| 77 83 N.-             | "             | 12 | 74        | 1      | 2         | " 8, '13     | 25 06.8      | "                 |



6 GEORGE V, A. 1916

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                    | Township. | Range. | Meridian. | Date.         | Declination. | Observer.         |
|---------------------------|-----------|--------|-----------|---------------|--------------|-------------------|
| 54°24 N.-NE. cor. sec. 36 | 74        | 1      | 2         | Mar. 11, '13  | 29 57.5      | E. W. Robinson.   |
| 60°27 N.-                 | 74        | 1      | 2         | " 7, '13      | 22 21.7      | "                 |
| 37°30 N.-                 | 75        | 1      | 2         | " 12, '13     | 25.1         | "                 |
| 46°20 N.-                 | 75        | 1      | 2         | " 13, '13     | 21 25.6      | "                 |
| 80°32 N.-                 | 75        | 1      | 2         | " 14, '13     | 20.0         | "                 |
| 8°00 N.-                  | 75        | 1      | 2         | " 15, '13     | 20 46.5      | "                 |
| 25°72 N.-                 | 75        | 1      | 2         | " 17, '13     | 45.8         | "                 |
| 7°50 N.-                  | 76        | 1      | 2         | " 18, '13     | 51.1         | "                 |
| 11°74 N.-                 | 76        | 1      | 2         | " 19, '13     | 44.8         | "                 |
| 13°57 N.-                 | 76        | 1      | 2         | " 20, '13     | 35.7         | "                 |
| 31°55 N.-                 | 76        | 1      | 2         | " 22, '13     | 44.3         | "                 |
| 28°10 N.-                 | 76        | 1      | 2         | " 24, '13     | 52.2         | "                 |
| 65°82 N.-                 | 77        | 1      | 2         | " 26, '13     | 48.6         | "                 |
| 40°00 N.-                 | 77        | 1      | 2         | " 27, '13     | 40.8         | "                 |
| 50°00 N.-                 | 77        | 1      | 2         | Apr. 1, '13   | 51.3         | "                 |
| 11°00 W.-                 | 78        | 1      | 2         | " 4, '13      | 21 07.3      | "                 |
| 9°00 N.-                  | 79        | 1      | 2         | " 11, '13     | 20 36.5      | "                 |
| *22°00 N.-                | 80        | 1      | 2         | " 16, '13     | 21 05.0      | "                 |
| 34°00 N.-                 | 81        | 1      | 2         | " 23, '13     | 20 45.0      | "                 |
| 6°00 N.-                  | 82        | 1      | 2         | " 29, '13     | 50.7         | "                 |
| 47°00 N.-                 | 83        | 1      | 2         | May 3, '13    | 21 13.5      | "                 |
| 69°00 N.-                 | 83        | 1      | 2         | May 5, '13    | 19 41.2      | "                 |
| 57°00 N.-                 | 83        | 1      | 2         | May 7, '13    | 20 49.1      | "                 |
| 25°09 N.-                 | 84        | 1      | 2         | May 10, '13   | 20 54.2      | "                 |
| 12°00 N.-                 | 85        | 1      | 2         | May 12, '13   | 21 49.8      | "                 |
| 46°50 W.-                 | 4         | 2      | 2         | June 12, '14  | 16 23.3      | A. G. Stuart.     |
| 46°50 W.-                 | 4         | 2      | 2         | June 12, '14  | 25.2         | "                 |
| 27°70 W.-                 | 47        | 2      | 2         | Aug. 25, '13  | 19 35.4      | P. E. Palmer.     |
| 69°00 E.-                 | 47        | 2      | 2         | Sept. 19, '13 | 01.7         | "                 |
| 6.00 W.-                  | 47        | 2      | 2         | " 27, '13     | 45.4         | "                 |
| 26°66 E.-                 | 47        | 2      | 2         | " 30, '13     | 28.5         | "                 |
| 16°00 S.-                 | 47        | 2      | 2         | Oct. 2, '13   | 31.0         | "                 |
| 50°95 S.-                 | 48        | 2      | 2         | Aug. 26, '13  | 18 50.2      | "                 |
| 7°87 W.-                  | 48        | 2      | 2         | " 19, '13     | 19 24.2      | "                 |
| 24°00 N.-                 | 49        | 2      | 2         | July 4, '13   | 34.4         | "                 |
| 11°70 E.-                 | 60        | 2      | 2         | June 1, '14   | 53.3         | E. S. Martindale. |
| 41°72 W.-                 | 4         | 3      | 2         | " 15, '14     | 17 01.8      | A. G. Stuart.     |
| 41°72 W.-                 | 4         | 3      | 2         | " 15, '14     | 02.2         | "                 |
| 62°68 N.-                 | 46        | 3      | 2         | Oct. 11, '13  | 19 44.3      | P. E. Palmer.     |
| 44°32 N.-                 | 46        | 3      | 2         | " 13, '13     | 31.1         | "                 |
| 12°53 S.-                 | 47        | 3      | 2         | Sept. 26, '13 | 34.0         | "                 |
| 76°75 W.-                 | 47        | 3      | 2         | Oct. 8, '13   | 14.8         | "                 |
| At SE.                    | 47        | 3      | 2         | " 9, '13      | 17.3         | "                 |
| 12°00 W.-                 | 47        | 3      | 2         | Dec. 19, '13  | 41.3         | "                 |
| 41°00 S. NE               | 48        | 3      | 2         | Aug. 30, '13  | 18 12.6      | "                 |
| 77°50 S.-                 | 48        | 3      | 2         | Sept. 2, '13  | 17 37.8      | "                 |
| At S.-                    | 48        | 3      | 2         | Aug. 29, '13  | 35.6         | "                 |
| 16°40 N.-                 | 48        | 3      | 2         | Sept. 1, '13  | 34.0         | "                 |
| 58°40 E.-                 | 60        | 3      | 2         | May 19, '14   | 21 14.6      | E. S. Martindale. |
| 13°50 W.-                 | 4         | 4      | 2         | June 16, '14  | 17 58.0      | A. G. Stuart.     |
| 13°50 W.-                 | 4         | 4      | 2         | June 16, '14  | 56.0         | "                 |
| 43°00 S.-                 | 47        | 4      | 2         | Dec. 9, '13   | 19 51.3      | P. E. Palmer.     |
| 22°52 W.-                 | 4         | 5      | 2         | June 17, '14  | 19 03.0      | A. G. Stuart.     |
| 15°50 E.-                 | 60        | 5      | 2         | May 13, '14   | 50.4         | E. S. Martindale. |
| 57°01 W.-                 | 4         | 6      | 2         | June 18, '14  | 18 68.6      | A. G. Stuart.     |
| 57°01 W.-                 | 4         | 6      | 2         | " 18, '14     | 09.4         | "                 |
| 20°26 E.-                 | 60        | 6      | 2         | Apr. 30, '14  | 20 40.9      | E. S. Martindale. |
| 53°15 W.-                 | 4         | 7      | 2         | June 19, '14  | 17 50.5      | A. G. Stuart.     |
| At                        | 4         | 9      | 2         | " 22, '14     | 45.5         | "                 |
| 74°72 W.-                 | 4         | 10     | 2         | " 24, '14     | 55.2         | "                 |
| 74°72 W.-                 | 4         | 10     | 2         | " 24, '14     | 56.3         | "                 |
| At                        | 48        | 10     | 2         | Oct. 8, '14   | 19 45.9      | J. H. McKnight.   |
| At                        | 48        | 10     | 2         | Apr. 9, '15   | 15 59.4      | G. J. Lonergan.   |
| 67°41 W.-                 | 4         | 11     | 2         | June 24, '14  | 17 57.1      | A. G. Stuart.     |



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—*Declination Observations.*—Continued.

| Place.                                     | Township. | Range. | Meridian. | Date.         | Declination. | Observer.         |
|--|-----------|--------|-----------|---------------|--------------|-------------------|
| 60°00 W.-NE. cor. sec. 9                   | 26        | 11     | 2         | Sept. 16, '14 | 19 02.6      | W. A. Fletcher.   |
| 50°00 W.-                                  | 26        | 11     | 2         | " 23, '14     | 03.2         | "                 |
| 45°00 S.-                                  | 36        | 12     | 2         | June 25, '14  | 18 21.2      | A. G. Stuart.     |
| 77°00 W.-                                  | 25        | 12     | 2         | July 4, '14   | 57.2         | W. A. Fletcher.   |
| 41°50 N.-                                  | 26        | 12     | 2         | Sept. 10, '14 | 19 11.1      | "                 |
| At   | 31        | 12     | 2         | Aug. 31, '14  | 32.6         | J. H. McKnight.   |
| 40°00 N.-                                  | 32        | 12     | 2         | Sept. 5, '14  | 32.4         | "                 |
| At   | 33        | 12     | 2         | Aug. 20, '14  | 08.7         | "                 |
| 22°70 N.-                                  | 60        | 12     | 2         | Mar. 22, '14  | 21 27.9      | E. S. Martindale. |
| 12°00 E.-                                  | 25        | 13     | 2         | July 21, '14  | 19 21.6      | W. A. Fletcher.   |
| 41°00 N.-                                  | 26        | 13     | 2         | Aug. 31, '14  | 17.2         | "                 |
| 40°00 N.- $\frac{1}{4}$ cor. N. by sec. 10 | 26        | 13     | 2         | " 30, '14     | 11.2         | "                 |
| 40°00 N.- $\frac{1}{4}$ cor. N. by sec. 10 | 27a       | 13     | 2         | " 20, '14     | 17.0         | "                 |
| 40°00 W.-SE. cor. sec. 3                   | 27        | 13     | 2         | Oct. 5, '14   | 17.3         | "                 |
| At NE. cor. sec. 16                        | 27        | 13     | 2         | " 14, '14     | 17.0         | "                 |
| 41°50 N.-                                  | 25        | 14     | 2         | July 23, '14  | 39.6         | "                 |
| 41°00 E.-                                  | 26        | 14     | 2         | " 26, '14     | 26.8         | "                 |
| At   | 27a       | 14     | 2         | Aug. 9, '14   | 22.8         | "                 |
| 10°50 N.-                                  | 60        | 14     | 2         | Mar. 17, '14  | 21 31.3      | E. S. Martindale. |
| 64°67 E.-NE. cor. sec. 36                  | 60        | 14     | 2         | " 17, '14     | 28.0         | "                 |
| 64°67 E.-                                  | 37        | 15     | 2         | Sept. 19, '14 | 19 44.7      | J. H. McKnight.   |
| 20°00 W.-                                  | 37        | 15     | 2         | " 26, '14     | 20 20.3      | "                 |
| 7°00 N.-                                   | 60        | 15     | 2         | Mar. 11, '14  | 20 33.5      | E. S. Martindale. |
| 10°82 W.-                                  | 60        | 15     | 2         | " 11, '14     | 25.1         | "                 |
| 10°82 W.-                                  | 4         | 15     | 2         | July 1, '14   | 18 15.5      | A. G. Stuart.     |
| 75°0 W.-                                   | 37        | 16     | 2         | Aug. 6, '14   | 19 58.7      | J. H. McKnight.   |
| At   | 37        | 16     | 2         | " 8, '14      | 56.0         | "                 |
| 40°00 S.-                                  | 60        | 16     | 2         | Feb. 28, '14  | 22 24.2      | E. S. Martindale. |
| 64°37 E.-                                  | 60        | 16     | 2         | Mar. 2, '14   | 21 42.7      | "                 |
| 20°70 E.-                                  | 60        | 16     | 2         | " 3, '14      | 43.5         | "                 |
| 20°70 E.-                                  | 60        | 16     | 2         | " 3, '14      | 43.7         | "                 |
| 20°70 E.-                                  | 60        | 16     | 2         | " 5, '14      | 28.9         | "                 |
| 45°14 E.-                                  | 4         | 17     | 2         | July 2, '14   | 18 05.1      | A. G. Stuart.     |
| 40°00 W.-                                  | 35        | 17     | 2         | June 13, '14  | 19 55.2      | J. H. McKnight.   |
| 15°00 N.-SE                                | 35        | 17     | 2         | " 15, '14     | 54.3         | "                 |
| 37°00 W.-                                  | 35        | 17     | 2         | " 16, '14     | 20 12.8      | "                 |
| 29°00 W.-NE                                | 35        | 17     | 2         | " 19, '14     | 19 43.0      | "                 |
| 33°00 W.-                                  | 37        | 17     | 2         | July 29, '14  | 20 00.0      | "                 |
| 40°00 N.-                                  | 60        | 17     | 2         | Feb. 17, '14  | 22 19.2      | E. S. Martindale. |
| 28°94 E.-                                  | 60        | 17     | 2         | " 25, '14     | 38.6         | "                 |
| 59°23 E.-                                  | 4         | 18     | 2         | July 3, '14   | 18 11.1      | A. G. Stuart.     |
| 20°00 W.-                                  | 33        | 18     | 2         | Sept. 15, '14 | 20 16.3      | J. H. McKnight.   |
| 32°00 N.-                                  | 36        | 18     | 2         | June 29, '14  | 19 56.3      | "                 |
| 31°20 W.-                                  | 37        | 18     | 2         | " 30, '14     | 58.5         | "                 |
| At   | 38        | 18     | 2         | July 15, '14  | 54.4         | "                 |
| 65°50 W.-                                  | 38        | 18     | 2         | " 16, '14     | 46.3         | "                 |
| 63°00 W.-                                  | 38        | 18     | 2         | " 24, '14     | 59.6         | "                 |
| 46°00 N.-                                  | 40        | 18     | 2         | June 11, '14  | 31.3         | R. C. Purser.     |
| 17°00 S.-                                  | 40        | 18     | 2         | " 12, '14     | 27.4         | "                 |
| 36°83 S.-                                  | 60        | 18     | 2         | Feb. 10, '14  | 24 39.7      | E. S. Martindale. |
| 1°47 E.-                                   | 60        | 18     | 2         | " 13, '14     | 23 59.5      | "                 |
| 52°50 E.-                                  | 4         | 19     | 2         | July 6, '14   | 18 14.6      | A. G. Stuart.     |
| 7°99 W.-                                   | 4         | 19     | 2         | " 5, '14      | 46.5         | C. Rinfret.       |
| At station 4, sec. 28                      | 4         | 19     | 2         | " 6, '14      | 40.5         | "                 |
| " 4, " 28                                  | 4         | 19     | 2         | " 9, '14      | 46.1         | "                 |
| " 4, " 28                                  | 5         | 19     | 2         | " 14, '14     | 54.1         | "                 |
| Sta. 4, Traverse MacDonagh L sec. 19       | 5         | 19     | 2         | " 17, '14     | 49.1         | "                 |
| " " " 19                                   | 5         | 19     | 2         | " 18, '14     | 47.5         | "                 |
| At station 2, sec. 4                       | 6         | 19     | 2         | " 19, '14     | 13.0         | "                 |
| " 2, " 4                                   | 6         | 19     | 2         | " 19, '14     | 27.4         | "                 |
| " 2, " 4                                   | 6         | 19     | 2         | " 20, '14     | 34.2         | "                 |
| " 2, " 4                                   | 6         | 19     | 2         | " 22, '14     | 14.2         | "                 |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                                  | Township. | Range. | Meridian. | Date.         | Declination. | Observer.         |
|---|-----------|--------|-----------|---------------|--------------|-------------------|
| Sta. 3, Traverse dry lake section 15.   | 8         | 19     | 2         | July 23, '14  | 19° 1'       | C. Rinfret.       |
| " " " 15.                               | 8         | 19     | 2         | " 25, '14     | 26° 1'       | "                 |
| 10° 48' bear. 312-01 NE cor. sec. 34.   | 9         | 19     | 2         | " 27, '14     | 39° 2'       | "                 |
| 10° 48' " 312-01 " 31                   | 9         | 19     | 2         | " 27, '14     | 42° 6'       | "                 |
| 10° 48' " 312-01 " 34                   | 9         | 19     | 2         | " 28, '14     | 45° 8'       | "                 |
| 20° 00' N.-SE. cor. sec. 16.            | 23        | 19     | 2         | Oct. 26, '14  | 19° 20' 6"   | R. C. Purser.     |
| 10° 00' E. N.E. " 22                    | 23        | 19     | 2         | " 26, '14     | 23° 6'       | "                 |
| 5° 00' S.- $\frac{1}{4}$ E. By sec. 7.  | 23        | 19     | 2         | " 28, '14     | 18° 52' 0"   | "                 |
| 40° 00' S.-NE cor. sec. 5               | 38        | 19     | 2         | July 5, '14   | 19° 40' 2"   | J. H. McKnight.   |
| At " 5                                  | 38        | 19     | 2         | " 6, '14      | 42° 7'       | "                 |
| 73° 88' W.- " 31                        | 4         | 21     | 2         | " 11, '14     | 18° 21' 0"   | A. G. Stuart.     |
| At " 35                                 | 5         | 21     | 2         | Nov. 27, '14  | 17° 49' 8"   | R. C. Purser.     |
| At M. " 36                              | 9         | 21     | 2         | July 29, '14  | 18° 19' 6"   | C. Rinfret.       |
| " 36                                    | 9         | 21     | 2         | " 30, '14     | 37° 2'       | "                 |
| 14° 85' E.- " 32                        | 60        | 21     | 2         | Nov. 18, '13  | 22° 57' 6"   | E. S. Martindale. |
| 37° 81' E.- " 35                        | 60        | 21     | 2         | Dec. 10, '13  | 55° 7'       | "                 |
| At Station 3, sec. 10                   | 9         | 22     | 2         | Aug. 3, '14   | 18° 11' 6"   | C. Rinfret.       |
| At " 10                                 | 9         | 22     | 2         | " 3, '14      | 16° 0'       | "                 |
| At " 10                                 | 9         | 22     | 2         | " 7, '14      | 07° 8'       | "                 |
| At $\frac{1}{4}$ E. By. sec. 29         | 25        | 22     | 2         | Oct. 20, '14  | 19° 49' 4"   | R. C. Purser.     |
| 10° 00' N.-NE cor. sec. 29              | 25        | 22     | 2         | " 20, '14     | 50° 6'       | "                 |
| 10° 00' N.- " 29                        | 25        | 22     | 2         | " 21, '14     | 55° 7'       | "                 |
| 5° 00' N.- $\frac{1}{4}$ E. By. sec. 32 | 25        | 22     | 2         | " 21, '14     | 59° 4'       | "                 |
| 5° 00' S.-NE. cor. sec. 32              | 25        | 22     | 2         | " 21, '14     | 58° 2'       | "                 |
| At " 30                                 | 25        | 22     | 2         | " 23, '14     | 52° 1'       | "                 |
| At " 19                                 | 25        | 22     | 2         | " 24, '14     | 53° 4'       | "                 |
| 19° 99' E.- " 32                        | 56        | 22     | 2         | Sept. 19, '13 | 22° 49' 5"   | E. S. Martindale. |
| 11° 40' E.- " 33                        | 56        | 22     | 2         | " 20, '13     | 28° 3'       | "                 |
| 75° 02' E.- " 35                        | 56        | 22     | 2         | " 23, '13     | 03° 2'       | "                 |
| 25° 00' N.- " 10                        | 8         | 23     | 2         | Aug. 8, '14   | 19° 05' 5"   | C. Rinfret.       |
| 2° 60' bear. 138°-40' NE. cor. sec. 10  | 8         | 23     | 2         | " 9, '14      | 05° 2'       | "                 |
| 2° 60' " " 10                           | 8         | 23     | 2         | " 9, '14      | 04° 2'       | "                 |
| 2° 60' " " 10                           | 8         | 23     | 2         | " 10, '14     | 10° 2'       | "                 |
| 10° 00' N.-NE. cor. sec. 34             | 19        | 23     | 2         | June 7, '14   | 50° 4'       | B. H. Segre.      |
| 10° 00' N.- " 34                        | 19        | 23     | 2         | " 8, '14      | 51° 8'       | "                 |
| 10° 23' E.- " 31                        | 56        | 23     | 2         | Sept. 6, '13  | 23° 18' 6"   | E. S. Martindale. |
| 17° 33' E.- " 32                        | 60        | 23     | 2         | Oct. 25, '13  | 23° 9'       | "                 |
| 9° 77' E.- " 34                         | 60        | 23     | 2         | " 28, '13     | 15° 4'       | "                 |
| 79° 25' E.- " 35                        | 60        | 23     | 2         | Nov. 1, '13   | 30° 0'       | "                 |
| 24° 16' E.- " 36                        | 60        | 23     | 2         | " 3, '13      | 30° 5'       | "                 |
| Sta. 3 traverse Olive lake, sec. 32     | 8         | 24     | 2         | Aug. 12, '14  | 19° 18' 3"   | C. Rinfret.       |
| " " 32                                  | 8         | 24     | 2         | " 13, '14     | 07° 3'       | "                 |
| " " 32                                  | 8         | 24     | 2         | " 14, '14     | 17° 9'       | "                 |
| 15° 55' E.-NE. cor. sec. 9              | 8         | 24     | 2         | " 19, '14     | 29° 9'       | "                 |
| Sta. 2 sec. 10                          | 8         | 24     | 2         | " 20, '14     | 17° 3'       | "                 |
| At station 2, sec. 10                   | 8         | 24     | 2         | " 20, '14     | 19° 30' 5"   | "                 |
| " " 10                                  | 8         | 24     | 2         | " 20, '14     | 21° 9'       | "                 |
| At NE. cor. sec. 33                     | 19        | 24     | 2         | June 11, '14  | 20° 25' 0"   | B. H. Segre.      |
| At " 33                                 | 19        | 24     | 2         | " 14, '14     | 26° 8'       | "                 |
| At " 33                                 | 19        | 24     | 2         | " 14, '14     | 25° 9'       | "                 |
| 52° 50' E.-NE. cor. sec. 31             | 56        | 24     | 2         | Aug. 27, '13  | 22° 32' 8"   | E. S. Martindale. |
| 73° 47' E.- " 34                        | 56        | 24     | 2         | Sept. 4, '13  | 23° 02' 9"   | "                 |
| 44° 99' E.- " 35                        | 56        | 24     | 2         | " 5, '13      | 01° 6'       | "                 |
| 29° 52' E.- " 35                        | 60        | 24     | 2         | Oct. 21, '13  | 22° 56' 5"   | "                 |
| 1° 00' N.- " 28                         | 6         | 25     | 2         | Dec. 19, '14  | 18° 39' 3"   | R. C. Purser.     |
| 40° 00' S.- " 8                         | 8         | 25     | 2         | Aug. 26, '14  | 19° 12' 5"   | C. Rinfret.       |
| 40° 00' S.- " 8                         | 8         | 25     | 2         | " 26, '14     | 19° 02' 1"   | "                 |
| 40° 00' S.- " 8                         | 8         | 25     | 2         | " 26, '14     | 05° 5'       | "                 |
| At " 34                                 | 17        | 25     | 2         | June 30, '14  | 20° 01' 7"   | B. H. Segre.      |
| 52° 87' E.- " 32                        | 56        | 25     | 2         | Aug. 19, '13  | 23° 34' 8"   | E. S. Martindale. |
| 12° 54' E.- " 33                        | 56        | 25     | 2         | " 20, '13     | 22° 45' 1"   | "                 |
| 31° 19' E.- " 33                        | 56        | 25     | 2         | " 21, '13     | 38° 8'       | "                 |
| 15° 40' E.- " 35                        | 56        | 25     | 2         | " 22, '13     | 49° 9'       | "                 |
| 21° 51' E.- " 34                        | 60        | 25     | 2         | Oct. 7, '13   | 23° 30' 7"   | "                 |



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                                | Township. | Range. | Meridian. | Date.         | Declination. | Observer.         |
|---------------------------------------|-----------|--------|-----------|---------------|--------------|-------------------|
| 68.72 E.-NE cor. sec. 34              | 60        | 25     | 2         | Oct. 8, '13   | 39.4         | E. S. Martindale. |
| At NE " 35                            | 4         | 26     | 2         | July 17, '14  | 18 51.9      | A. G. Stuart.     |
| 40.00 E.-" 20                         | 39        | 26     | 2         | Aug. 26, '14  | 21 28.3      | R. Neelands.      |
| At Centre sec. 24                     | 39        | 26     | 2         | Sept. 14, '14 | 39.5         | "                 |
| At NE. cor. sec. 10                   | 41        | 26     | 2         | " 20, '14     | 19 38.3      | "                 |
| 40.00 S.-" 11                         | 49        | 26     | 2         | Jan. 2, '14   | 22 26.6      | "                 |
| 35.3 N.-" 1                           | 49        | 26     | 2         | " 9, '14      | 23 02.2      | "                 |
| 6.99 E.-" 33                          | 60        | 26     | 2         | Oct 9, '13    | 17.8         | E. S. Martindale. |
| 6.99 E.-" 33                          | 60        | 26     | 2         | " 11, '13     | 22 57.3      | "                 |
| At Sta. 4 sec 22                      | 12        | 27     | 2         | Oct. 14, '14  | 19 56.9      | C. Rinfret.       |
| " 22                                  | 12        | 27     | 2         | " 11, '14     | 51.7         | "                 |
| " 22                                  | 12        | 27     | 2         | " 14, '14     | 54.3         | "                 |
| 65.00 S.-NE. cor. sec. 11             | 18        | 27     | 2         | July 5, '14   | 58.4         | B. H. Segre.      |
| 65.00 S.-" 11                         | 18        | 27     | 2         | " 5, '14      | 20 04.4      | "                 |
| 65.00 S.-" 11                         | 18        | 27     | 2         | " 5, '14      | 06.2         | "                 |
| 65.00 S.-" 30                         | 19        | 27     | 2         | " 19, '14     | 12.9         | "                 |
| 65.00 S.-" 30                         | 19        | 27     | 2         | " 19, '14     | 11.8         | "                 |
| 65.00 S.-" 32                         | 25        | 27     | 2         | Oct. 17, '14  | 38.6         | R. C. Purser.     |
| At Centre " 4                         | 46        | 27     | 2         | June 13, '14  | 22 42.0      | R. Neelands.      |
| 0.50 E.-NE " 33                       | 56        | 27     | 2         | July 15, '13  | 23 08.2      | E. S. Martindale. |
| 47.26 E.-" 34                         | 56        | 27     | 2         | " 17, '13     | 17.6         | "                 |
| 16.65 E.-" 35                         | 56        | 27     | 2         | " 18, '13     | 23.3         | "                 |
| 19.97 E.-" 36                         | 56        | 27     | 2         | " 23, '13     | 27.5         | "                 |
| 67.58 E.-" 36                         | 60        | 27     | 2         | Oct. 10, '13  | 28.9         | "                 |
| 71.00 W.-" 31                         | 4         | 28     | 2         | July 20, '14  | 19 35.3      | A. G. Stuart.     |
| 71.00 W.-" 31                         | 4         | 28     | 2         | " 20, '14     | 36.5         | "                 |
| 24.95 Bear 105.42' NE cor. sec. 24    | 7         | 28     | 2         | Sept. 2, '14  | 31.5         | C. Rinfret.       |
| 24.95 " " 24                          | 7         | 28     | 2         | " 3, '14      | 29.9         | "                 |
| 24.95 " " 24                          | 7         | 28     | 2         | " 3, '14      | 28.3         | "                 |
| 35.00 S.-NE cor. sec. 15              | 18        | 28     | 2         | July 12, '14  | 43.5         | B. H. Segre.      |
| 35.00 S.-" 15                         | 18        | 28     | 2         | " 13, '14     | 46.8         | "                 |
| 35.00 S.-" 15                         | 18        | 28     | 2         | " 13, '14     | 46.5         | "                 |
| 40.00 S.-" 21                         | 41        | 28     | 2         | Aug. 15, '14  | 21 34.8      | R. Neelands.      |
| Centre NE 1/4 sec 14                  | 42        | 28     | 2         | " 5, '14      | 43.1         | "                 |
| 12.00 E.-NE cor. sec. 35              | 43        | 28     | 2         | July 14, '14  | 20 53.1      | "                 |
| 12.00 N " 22                          | 44        | 28     | 2         | " 10, '14     | 23 50.3      | "                 |
| Sta. 2 Traverse Shallow lake sec 1    | 7         | 29     | 2         | Sept. 3, '14  | 19 52.0      | C. Rinfret.       |
| " " " 1                               | 7         | 29     | 2         | " 4, '14      | 19 49.4      | "                 |
| " " " 1                               | 7         | 29     | 2         | " 4, '14      | 52.4         | "                 |
| 5.00 N.-NE cor. sec. 34               | 17        | 29     | 2         | Aug. 2, '14   | 47.1         | B. H. Segre.      |
| 10.00 W.-" 36                         | 19        | 29     | 2         | July 22, '14  | 20 11.8      | "                 |
| 10.00 W.-" 36                         | 19        | 29     | 2         | " 26, '14     | 17.7         | "                 |
| 10.00 W.-" 36                         | 19        | 29     | 2         | " 26, '14     | 14.9         | "                 |
| 48.20 bear. 133 51' N.E. cor. sec. 32 | 5         | 1      | 3         | Sept. 28, '14 | 19 33.8      | C. Rinfret.       |
| 48.20 " 133 51' " 32                  | 5         | 1      | 3         | " 28, '14     | 36.0         | "                 |
| 48.20 " 133 51' " 32                  | 5         | 1      | 3         | " 29, '14     | 29.6         | "                 |
| Sta. 3 Twelve mile lake sec. 10       | 6         | 1      | 3         | " 10, '14     | 44.5         | "                 |
| 55.60 S.-N.E. cor. sec. 10            | 14        | 1      | 3         | July 18, '14  | 22 11.6      | G. C. Cowper.     |
| 10.00 N.-" 5                          | 14        | 1      | 3         | " 19, '14     | 10.1         | "                 |
| 9.00 W.-" 5                           | 14        | 1      | 3         | " 19, '14     | 09.9         | "                 |
| 18.00 N.-" 36                         | 68        | 1      | 3         | " 3, '13      | 23 33.3      | A. Saint Cyr.     |
| 1.00 N.-" 13                          | 69        | 1      | 3         | " 13, '13     | 19.6         | "                 |
| 1.00 N.-" 13                          | 69        | 1      | 3         | " 13, '13     | 02.2         | "                 |
| 33.00 N.-" 36                         | 69        | 1      | 3         | " 30, '13     | 29.1         | "                 |
| 72.00 N.-" 13                         | 70        | 1      | 3         | Aug. 10, '13  | 33.2         | "                 |
| 18.00 N.-" 24                         | 70        | 1      | 3         | " 14, '13     | 22 22.9      | "                 |
| 18.00 N.-" 24                         | 70        | 1      | 3         | " 14, '13     | 23.9         | "                 |
| 62.00 N.-" 1                          | 71        | 1      | 3         | " 19, '13     | 46.3         | "                 |
| 58.00 N.-" 13                         | 71        | 1      | 3         | " 26, '13     | 23 39.5      | "                 |
| 48.00 N.-" 25                         | 71        | 1      | 3         | " 28, '13     | 22.2         | "                 |
| 48.00 N.-" 25                         | 71        | 1      | 3         | " 28, '13     | 14.8         | "                 |
| 40.00 N.-" 24                         | 72        | 1      | 3         | Sept. 3, '13  | 22 57.0      | "                 |
| 40.00 N.-" 24                         | 72        | 1      | 3         | " 5, '13      | 23 05.1      | "                 |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                                   | Township. | Range. | Meridian. | Date.         | Declination. | Observer.     |
|--|-----------|--------|-----------|---------------|--------------|---------------|
| 34° 00' W. N.E. cor. sec. 34             | 72        | 1      | 3         | Sept. 13, '13 | 21 28.3      | A. Saint Cyr. |
| 34° 00' W. " 34                          | 72        | 1      | 3         | " 14, '13     | 57.7         | "             |
| 41° 00' W. " 32                          | 72        | 1      | 3         | " 22, '13     | 22 22.0      | "             |
| 41° 00' W. " 32                          | 72        | 1      | 3         | " 23, '13     | 20.5         | "             |
| 41° 00' W. " 32                          | 72        | 1      | 3         | " 24, '13     | 21 36.2      | "             |
| At " 36                                  | 4         | 2      | 3         | July 24, '14  | 19 35.1      | A. G. Stuart. |
| At " 36                                  | 4         | 2      | 3         | " 24, '14     | 25.3         | "             |
| Sta. 37 Twelve mile lake sec. 22         | 6         | 2      | 3         | Sept. 16, '14 | 55.8         | C. Rinfret.   |
| " " " 22                                 | 6         | 2      | 3         | " 16, '14     | 20 03.2      | "             |
| 37 " " 22                                | 6         | 2      | 3         | " 13, '14     | 19 55.4      | "             |
| 24° 00' W. N.E. cor. sec. 36             | 72        | 3      | 3         | " 30, '13     | 22 23.0      | A. Saint Cyr. |
| 41° 00' W. " 36                          | 72        | 3      | 3         | " 30, '13     | 14.1         | "             |
| 41° 00' W. " 36                          | 72        | 3      | 3         | Oct. 2, '13   | 24.0         | "             |
| 65° 00' W. " 36                          | 72        | 3      | 3         | " 4, '13      | 21 48.1      | "             |
| 65° 00' W. " 36                          | 72        | 3      | 3         | " 4, '13      | 45.7         | "             |
| 40° 00' W. " 34                          | 72        | 2      | 3         | " 10, '13     | 23 34.6      | "             |
| 61° 00' W. " 34                          | 72        | 2      | 3         | " 11, '13     | 24 24.4      | "             |
| 61° 00' W. " 33                          | 72        | 2      | 3         | " 15, '13     | 37.3         | "             |
| 75° 00' W. " 31                          | 72        | 3      | 3         | " 22, '13     | 22 46.8      | "             |
| 20° 30' bear. 109° 11' N.E. cor. sec. 36 | 5         | 3      | 3         | Sept. 27, '14 | 20 05.3      | C. Rinfret.   |
| 20° 30' " 109° 11' " 36                  | 5         | 3      | 3         | " 28, '14     | 04.7         | "             |
| Twelve mile lake sec. 27                 | 6         | 3      | 3         | " 22, '14     | 19 21.6      | "             |
| " " " "                                  | 6         | 3      | 3         | " 23, '14     | 39.8         | "             |
| " " " "                                  | 6         | 3      | 3         | " 23, '14     | 24.6         | "             |
| 37° 00' W. N.E. cor. sec. 12             | 14        | 3      | 3         | July 30, '14  | 20 52.1      | R. C. Purser. |
| At " 18                                  | 22        | 3      | 3         | Sept. 30, '14 | 49.4         | B. H. Segre.  |
| At " 18                                  | 22        | 3      | 3         | Oct. 5, '14   | 56.1         | "             |
| At " 18                                  | 22        | 3      | 3         | " 5, '14      | 55.5         | "             |
| 11° 00' W. " 34                          | 72        | 3      | 3         | Nov. 4, '13   | 23 56.7      | A. Saint Cyr. |
| 30° 00' W. " 34                          | 72        | 3      | 3         | " 5, '13      | 03.8         | "             |
| 30° 00' W. " 34                          | 72        | 3      | 3         | " 10, '13     | 29.4         | "             |
| 20° 00' W. " 31                          | 72        | 3      | 3         | " 14, '13     | 32.8         | "             |
| 70° 00' W. " 31                          | 72        | 3      | 3         | " 15, '13     | 24 59.1      | "             |
| At " 35                                  | 4         | 4      | 3         | July 27, '14  | 18 56.2      | A. G. Stuart. |
| At " 35                                  | 4         | 4      | 3         | " 27, '14     | 53.0         | "             |
| 5° 00' E. " 7                            | 19        | 4      | 3         | Sept. 22, '14 | 21 09.4      | B. H. Segre.  |
| 20° 00' S. " 19                          | 20        | 4      | 3         | Aug. 15, '14  | 18.4         | "             |
| 20° 00' S. " 19                          | 20        | 4      | 3         | " 15, '14     | 21 14.7      | "             |
| At " 19                                  | 20        | 4      | 3         | Sept. 23, '14 | 06.1         | "             |
| 8° 00' W. " 36                           | 72        | 4      | 3         | Nov. 15, '13  | 23 25.5      | A. Saint Cyr. |
| 14° 00' W. " 34                          | 72        | 4      | 3         | " 19, '13     | 48.9         | "             |
| 33° 00' W. " 33                          | 72        | 4      | 3         | " 21, '13     | 24 28.2      | "             |
| 80° 00' W. " 33                          | 72        | 4      | 3         | " 21, '13     | 27.4         | "             |
| 40° 00' W. " 31                          | 72        | 4      | 3         | " 25, '13     | 05.3         | "             |
| 40° 00' W. " 35                          | 72        | 5      | 3         | " 28, '13     | 25 35.9      | "             |
| 10° 00' W. " 34                          | 72        | 5      | 3         | " 29, '13     | 22.4         | "             |
| 10° 00' W. " 34                          | 72        | 5      | 3         | " 29, '13     | 24 22.1      | "             |
| 25° 00' W. " 33                          | 72        | 5      | 3         | Dec. 2, '13   | 56.1         | "             |
| 25° 00' W. " 33                          | 72        | 5      | 3         | " 2, '13      | 25.5         | "             |
| 51° 00' W. " 33                          | 72        | 5      | 3         | " 4, '13      | 35.8         | "             |
| 71° 00' W. " 32                          | 72        | 5      | 3         | " 4, '13      | 18.1         | "             |
| 46° 00' W. " 31                          | 4         | 6      | 3         | Aug. 1, '14   | 21 20.2      | A. G. Stuart. |
| 52° 00' W. " 34                          | 72        | 6      | 3         | Dec. 12, '13  | 24 15.9      | A. Saint Cyr. |
| 12° 00' W. " 33                          | 72        | 6      | 3         | " 13, '13     | 25 31.5      | "             |
| 38° 00' W. " 33                          | 72        | 6      | 3         | " 13, '13     | 24 05.2      | "             |
| 60° 00' W. " 33                          | 72        | 6      | 3         | " 15, '13     | 25 47.8      | "             |
| 25° 00' W. " 32                          | 72        | 6      | 3         | " 15, '13     | 24 42.6      | "             |
| *Sta. 4 S. Sask. R                       | 22        | 7      | 3         | Sept. 6, '14  | 21 47.1      | B. H. Segre.  |
| " 4 " "                                  | 22        | 7      | 3         | " 6, '14      | 40.3         | "             |
| 15° 00' N. N.E. cor. sec. 3              | 53        | 7      | 3         | Oct. 13, '14  | 23 09.3      | R. Neelands.  |
| 36° 00' W. " 36                          | 72        | 7      | 3         | Dec. 19, '13  | 25 49.9      | A. Saint Cyr. |
| 1° 00' W. " 35                           | 72        | 7      | 3         | " 19, '13     | 24 58.3      | "             |
| 39° 00' W. " 35                          | 72        | 7      | 3         | " 20, '13     | 26 09.2      | "             |
| 12° 00' W. " 34                          | 72        | 7      | 3         | " 20, '13     | 15.1         | "             |



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place.                     | Township. | Range. | Meridian. | Date.         | Declination. | Observer.     |
|----------------------------|-----------|--------|-----------|---------------|--------------|---------------|
| 52°00 W.-N.E. cor. sec. 34 | 72        | 7      | 3         | Dec. 23, '13  | 18°5         | A. Saint Cyr. |
| 81°00 W.-" 34              | 72        | 7      | 3         | " 23, '13     | 11 0         | "             |
| 81°00 W.-" 34              | 72        | 7      | 3         | " 26, '13     | 25 33.0      | "             |
| 27°50 W.-" 33              | 72        | 7      | 3         | " 26, '13     | 26 07.9      | "             |
| At " 32                    | 72        | 7      | 3         | " 27, '13     | 27 39.7      | "             |
| 39°00 W.-" 32              | 72        | 7      | 3         | " 27, '13     | 07.2         | "             |
| 9°00 W.-" 31               | 72        | 7      | 3         | " 29, '13     | 26 35.4      | "             |
| 9°00 W.-" 31               | 72        | 7      | 3         | " 29, '13     | 27.5         | "             |
| 10°00 W.-" 8               | 13        | 8      | 3         | Sept. 21, '14 | 21 40.0      | G. C. Cowper. |
| 32°00 S.-" 18              | 11        | 8      | 3         | " 21, '14     | 20 01.1      | "             |
| 5°00 N.-" 18               | 24        | 8      | 3         | " 28, '14     | 21 29.1      | S. L. Evans.  |
| 10°00 N.-" 8               | 26        | 8      | 3         | Oct. 8, '14   | 21 31.6      | "             |
| 15°00 S.-" 16              | 26        | 8      | 3         | " 16, '14     | 23.8         | "             |
| 28°00 W.-" 34              | 72        | 8      | 3         | Jan. 5, '14   | 25 44.3      | A. Saint Cyr. |
| 28°00 W.-" 33              | 72        | 8      | 3         | " 6, '14      | 26 09.2      | "             |
| 68°00 W.-" 33              | 72        | 8      | 3         | " 6, '14      | 29.0         | "             |
| 74°00 W.-" 31              | 72        | 8      | 3         | " 16, '14     | 25 47.0      | "             |
| 50°00 W.-" 34              | 4         | 9      | 3         | Aug. 3, '14   | 20 52.7      | A. G. Stuart. |
| 50°00 W.-" 34              | 4         | 9      | 3         | " 3, '14      | 21 25.7      | "             |
| At " 34                    | 12        | 9      | 3         | Sept. 22, '14 | 12.1         | G. C. Cowper. |
| 20°00 N.-" 9               | 21        | 9      | 3         | Aug. 14, '14  | 56.6         | R. C. Purser. |
| 0°50 S.-" 26               | 24        | 9      | 3         | Sept. 26, '14 | 43.5         | S. L. Evans.  |
| 36°00 S.-" 25              | 24        | 9      | 3         | " 28, '14     | 29.6         | "             |
| 11°00 W.-" 36              | 72        | 9      | 3         | Jan. 16, '14  | 25 59.0      | A. Saint Cyr. |
| 43°00 W.-" 38              | 72        | 9      | 3         | " 17, '14     | 53.3         | "             |
| 72°00 W.-" 36              | 72        | 9      | 3         | " 17, '14     | 26 01.2      | "             |
| 40°00 S.-" 29              | 13        | 10     | 3         | Sept. 19, '14 | 21 04.9      | G. C. Cowper. |
| 7°00 N.-" 18               | 26        | 10     | 3         | Oct. 13, '14  | 39.5         | S. L. Evans.  |
| 0°50 N.-" 14               | 26        | 10     | 3         | " 14, '14     | 22 02.5      | "             |
| 1°00 S.-" 11               | 26        | 10     | 3         | " 14, '14     | 00.3         | "             |
| At " 36                    | 72        | 10     | 3         | Jan. 27, '14  | 26 58.4      | A. Saint Cyr. |
| At " 36                    | 72        | 10     | 3         | " 27, '14     | 27 03.1      | "             |
| 0°50 E.-" 24               | 26        | 11     | 3         | Oct. 12, '14  | 21 46.2      | S. L. Evans.  |
| 54°00 W.-" 34              | 72        | 11     | 3         | Feb. 11, '14  | 27 21.5      | A. Saint Cyr. |
| 9°00 W.-" 33               | 72        | 11     | 3         | " 12, '14     | 57.4         | "             |
| 79°00 W.-" 33              | 72        | 11     | 3         | " 12, '14     | 21.4         | "             |
| 31°00 N.-" 35              | 11        | 12     | 3         | Sept. 6, '14  | 21 07.6      | G. C. Cowper. |
| 75°68 N.-" 23              | 39        | 12     | 3         | " 18, '14     | 23 50.6      | R. C. Purser. |
| At " 23                    | 39        | 12     | 3         | " 19, '14     | 48.7         | "             |
| At " 26                    | 39        | 12     | 3         | " 19, '14     | 45.0         | "             |
| 80°00 W.-" 36              | 72        | 12     | 3         | Feb. 17, '14  | 26 16.1      | A. Saint Cyr. |
| 49°00 W.-" 35              | 72        | 12     | 3         | " 18, '14     | 25 29.5      | "             |
| 13°00 W.-" 34              | 72        | 12     | 3         | " 19, '14     | 23.8         | "             |
| 11°00 W.-" 31              | 72        | 12     | 3         | " 25, '14     | 26 26.6      | "             |
| At " 13                    | 13        | 13     | 3         | Sept. 17, '14 | 21 19.0      | G. C. Cowper. |
| 30°00 S.-" 32              | 29        | 13     | 3         | " 7, '14      | 22.5         | R. C. Purser. |
| 1-4 cor. E. by sec. 24.    | 39        | 13     | 3         | " 16, '14     | 21 01.5      | "             |
| 1-4 " 1                    | 39        | 13     | 3         | " 23, '14     | 23 59.7      | "             |
| 61°00 S.-N.E. cor. sec. 21 | 39        | 13     | 3         | May 22, '14   | 55.1         | S. L. Evans.  |
| 36°00 S.-" 15              | 39        | 13     | 3         | " 26, '14     | 44.7         | "             |
| 0°50 E.-S.E. " 2           | 39        | 13     | 3         | June 16, '14  | 54.9         | "             |
| 5°00 S.-N.E. " 23          | 39        | 13     | 3         | May 20, '14   | 57.5         | "             |
| 56°00 S.-" 14              | 39        | 13     | 3         | " 30, '14     | 24 00.0      | "             |
| 77°00 S.-" 24              | 39        | 13     | 3         | June 23, '14  | 23 58.5      | "             |
| 20°00 S.-" 29              | 39        | 13     | 3         | July 21, '14  | 24 02.8      | "             |
| 49°50 S.-" 29              | 39        | 13     | 3         | " 22, '14     | 05.0         | "             |
| 12°00 W.-" 39              | 39        | 13     | 3         | " 25, '14     | 04.8         | "             |
| 3°00 W.-" 36               | 72        | 13     | 3         | Feb. 26, '14  | 26 00.3      | A. Saint Cyr. |
| 70°00 W.-" 34              | 72        | 13     | 3         | Mar. 3, '14   | 25 55.6      | "             |
| 61°00 W.-" 32              | 72        | 13     | 3         | " 4, '14      | 25 27.3      | "             |
| 30°00 W.-" 23              | 71        | 13     | 3         | " 9, '14      | 26 01.0      | "             |
| 30°00 W.-" 32              | 4         | 14     | 3         | Aug. 11, '14  | 20 01.7      | A. G. Stuart. |
| 1°00 N.-" 7                | 38        | 14     | 3         | July 8, '14   | 23 45.9      | E. P. Bowman. |



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RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place.                    | Township. | Range. | Meridian. | Date.         | Declination. | Observer.      |
|---------------------------|-----------|--------|-----------|---------------|--------------|----------------|
| 40°00 S.-NE. cor. sec. 1  | 39        | 14     | 3         | July 23, '14  | 23 54.0      | E. P. Bowman.  |
| 0.04 W.-                  | 27        | 14     | 3         | " 25, '14     | 24 13.0      | "              |
| At                        | 31        | 14     | 3         | Aug. 5, '14   | 23 48.3      | "              |
| At                        | 31        | 14     | 3         | " 15, '14     | 24 00.9      | "              |
| 38°00 W.-                 | 36        | 14     | 3         | Mar. 7, '14   | 26 29.5      | A. Saint Cyr.  |
| 69°00 W.-                 | 35        | 14     | 3         | " 9, '14      | 06.5         | "              |
| At                        | 32        | 14     | 3         | " 10, '14     | 10.5         | "              |
| 36°00 W.-                 | 31        | 4      | 3         | Aug. 12, '14  | 20 09.8      | A. G. Stuart.  |
| 36°00 W.-                 | 31        | 4      | 3         | " 12, '14     | 08.7         | "              |
| 31°00 N.-                 | 35        | 11     | 3         | Sept. 3, '14  | 21 13.8      | G. C. Cowper.  |
| 31°00 E.-                 |           |        |           |               |              |                |
| 4.50 E.-                  | 15        | 14     | 3         | " 9, '14      | 13.0         | "              |
| 5.00 S.-                  |           |        |           |               |              |                |
| 30°00 S.-                 | 26        | 19     | 3         | Oct. 9, '14   | 59.7         | R. C. Purser.  |
| 20°00 S. ¼ E. by 35       | 35        | 19     | 3         | " 12, '14     | 58.2         | "              |
| ¼ E. by sec 31            | 24        | 15     | 3         | Aug. 26, '14  | 22 11.4      | "              |
| 40°00 W.-NE. cor. sec. 31 | 35        | 15     | 3         | Oct. 14, '14  | 23 55.9      | G. A. Bennett  |
| At                        | 23        | 37     | 3         | July 4, '14   | 43.6         | E. P. Bowman.  |
| 40°00 S.-                 | 14        | 38     | 3         | " 13, '14     | 24 08.1      | "              |
| At                        | 19        | 39     | 3         | Aug. 26, '14  | 23 00.9      | "              |
| 20°00 W.-                 | 24        | 71     | 3         | Mar. 15, '14  | 24 24.8      | A. Saint Cyr.  |
| 20°00 W.-                 | 24        | 71     | 3         | " 18, '14     | 31.9         | "              |
| 20°00 W.-                 | 24        | 71     | 3         | " 25, '14     | 27.8         | "              |
| 20°00 W.-                 | 24        | 71     | 3         | " 27, '14     | 38.0         | "              |
| 20°00 W.-                 | 24        | 71     | 3         | " 27, '14     | 41.0         | "              |
| 50°00 W.-                 | 36        | 72     | 3         | " 13, '14     | 25 53.2      | "              |
| 40°00 W.-                 | 34        | 72     | 3         | " 14, '14     | 26 13.6      | "              |
| At                        | 32        | 72     | 3         | " 17, '14     | 27 21.9      | "              |
| 24°50 W.-                 | 31        | 72     | 3         | " 18, '14     | 21.1         | "              |
| 40°00 S.-                 | 34        | 37     | 3         | June 22, '14  | 24 12.1      | E. P. Bowman.  |
| At                        | 36        | 37     | 3         | July 1, '14   | 41.2         | "              |
| 42°50 E.-                 | 7         | 40     | 3         | Aug. 27, '14  | 25 20.3      | "              |
| At                        | 35        | 72     | 3         | Mar. 20, '14  | 27 29.2      | A. Saint Cyr.  |
| 40°00 W.-                 | 33        | 72     | 3         | " 21, '14     | 22.7         | "              |
| 1°00 N.-                  | 1         | 39     | 3         | June 11, '14  | 24 34.5      | E. P. Bowman.  |
| 2°00 N.-                  | 18        | 40     | 3         | Sept. 3, '14  | 23 51.6      | "              |
| 8°00 W.-                  | 36        | 72     | 3         | " 24, '14     | 27 19.1      | A. Saint Cyr.  |
| 40°00 W.-                 | 35        | 72     | 3         | " 25, '14     | 26 51.6      | "              |
| 18°00 W.-                 | 34        | 72     | 3         | " 26, '14     | 27 10.4      | "              |
| 40°00 W.-                 | 33        | 72     | 3         | " 28, '14     | 12.1         | "              |
| 30°00 W.-                 | 31        | 4      | 3         | Aug. 15, '14  | 21 18.5      | A. G. Stuart.  |
| 16°00 N.-                 | 35        | 9      | 3         | Aug. 29, '14  | 07.6         | G. C. Cowper.  |
| 12°00 E.-                 |           |        |           |               |              |                |
| At                        | 36        | 12     | 3         | Aug. 26, '14  | 29.7         | "              |
| 30°00 N.-                 | 24        | 35     | 3         | Oct. 1, '14   | 24 10.1      | G. A. Bennett. |
| 12°00 N.-                 | 5         | 13     | 3         | Aug. 16, '14  | 21 45.2      | G. C. Cowper.  |
| 10°00 E.-                 | 35        | 13     | 3         | " 25, '14     | 35.8         | "              |
| 20°50 S.-                 | 34        | 14     | 3         | " 20, '14     | 22 17.3      | "              |
| 23°00 E.-                 |           |        |           |               |              |                |
| 11°50 S.-                 | 3         | 23     | 3         | Oct. 13, '14  | 31.0         | "              |
| 31°00 W.-                 |           |        |           |               |              |                |
| 49°00 S.-                 | 9         | 23     | 3         | " 17, '14     | 27.3         | "              |
| 12°00 W.-                 |           |        |           |               |              |                |
| 20°00 E.-                 | 8         | 8      | 3         | Aug. 9, '14   | 21 34.4      | "              |
| 55°00 S.-                 | 32        | 9      | 3         | " 10, '14     | 35.7         | "              |
| 9°00 W.-                  |           |        |           |               |              |                |
| 25°00 N.-                 | 25        | 31     | 3         | " 31, '14     | 35.0         | G. A. Bennett. |
| 20°00 S.-                 | 22        | 31     | 3         | Sept. 28, '14 | 22 49.6      | "              |
| ¼ on E by sec.            | 32        | 36     | 3         | Aug. 7, '14   | 22 40.5      | R. C. Purser.  |
| 0°57 E.-NE. cor. sec. 33  | 47        | 20     | 3         | Sept. 30, '14 | 25 33.9      | "              |
| 5°00 N.-                  | 32        | 15     | 3         | Aug. 26, '14  | 24 05.9      | S. L. Evans    |
| 0°50 N.-                  | 9         | 16     | 3         | " 24, '14     | 23 03.0      | "              |
| 1°50 S.-                  | 12        | 16     | 3         | " 25, '14     | 21 45.2      | "              |
| 3°50 N.-                  | 11        | 16     | 3         | " 25, '14     | 37.7         | "              |



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*

Table I.—Declination Observations.—Continued.

| Place.                   | Township. | Range. | Meridian. | Date.         | Declination. | Observer.      |
|--------------------------|-----------|--------|-----------|---------------|--------------|----------------|
| 0°50 N.-NE. cor. sec. 10 | 16        | 21     | 3         | Aug. 25, '14  | 28°6         | S. L. Evans.   |
| 78°00 S.                 | 16        | 21     | 3         | " 26, '14     | 23 24.2      | "              |
| 5°00 N.-                 | 16        | 21     | 3         | " 27, '14     | 21 43.0      | "              |
| 5°00 N.-                 | 16        | 21     | 3         | " 27, '14     | 38 1         | "              |
| 5°00 N.-                 | 16        | 21     | 3         | " 27, '14     | 22 20.3      | "              |
| 9°00 W.-                 | 16        | 21     | 3         | " 27, '14     | 39 6         | "              |
| 52°00 W.-                | 16        | 21     | 3         | " 27, '14     | 23 45.9      | "              |
| 20°00 W.-                | 35        | 21     | 3         | Sept. 20, '14 | 35.4         | G. A. Bennett. |
| At                       | 63        | 21     | 3         | Jan. 27, '14  | 27 50.6      | A. L. Cumming. |
| 6°75 S.-                 | 31        | 22     | 3         | Aug. 24, '14  | 24 00.9      | G. A. Bennett. |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 23 59.6      | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 57 0         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 57.5         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 58.5         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 56.6         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 56.2         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 58.2         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 57.5         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 55.9         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 59.5         | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 17, '14     | 24 00.1      | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 22 57.5      | "              |
| *35°00 W.-               | 31        | 22     | 3         | " 27, '14     | 56.8         | "              |
| 35°00 W.-                | 31        | 22     | 3         | " 27, '14     | 57.2         | "              |
| 35°00 W.-                | 31        | 22     | 3         | " 27, '14     | 23 56.5      | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 57.5         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 55.7         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 53.3         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 54.0         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 55.0         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 54.5         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 54.3         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 52.2         | "              |
| 35°00                    | 31        | 22     | 3         | " 27, '14     | 54.1         | "              |
| 35°00                    | 32        | 22     | 3         | " 26, '14     | 03.2         | "              |
| *30°00 S.-               | 33        | 22     | 3         | Sept. 5, '14  | 11.9         | "              |
| At                       | 35        | 22     | 3         | " 17, '14     | 52.7         | "              |
| 24°50 S.-                | 36        | 22     | 3         | " 15, '14     | 50.3         | "              |
| 47°00 S.-                | 52        | 22     | 3         | Oct. 10, '14  | 24 52.8      | E. P. Bowman.  |
| 1°00 W.-SE.              | 23        | 23     | 3         | Aug. 30, '14  | 20 59.4      | S. L. Evans.   |
| 3°00 W.-                 | 23        | 23     | 3         | Sept. 1, '14  | 21 02.1      | "              |
| 5°00 S.                  | 23        | 23     | 3         | " 1, '14      | 20 56.6      | "              |
| 27°00 N.-                | 23        | 23     | 3         | " 3, '14      | 21 02.8      | "              |
| *4°00 N.-                | 23        | 23     | 3         | " 5, '14      | 08.9         | "              |
| 5°50 S.-                 | 23        | 23     | 3         | " 21, '14     | 12.0         | "              |
| 0°25 S.-                 | 23        | 23     | 3         | " 21, '14     | 09.0         | "              |
| 2°00 S.-                 | 23        | 23     | 3         | " 21, '14     | 02.2         | "              |
| 0°50 S.-                 | 23        | 23     | 3         | " 21, '14     | 05.0         | "              |
| At NW.                   | 45        | 23     | 3         | Aug. 20, '13  | 24 45.7      | A. L. Cumming. |
| At                       | 45        | 23     | 3         | " 29, '13     | 45.5         | "              |
| At                       | 45        | 23     | 3         | " 29, '13     | 45.3         | "              |
| At NE.                   | 45        | 23     | 3         | " 25, '13     | 49 1         | "              |
| 22°00 S.-                | 45        | 23     | 3         | " 25, '13     | 50.3         | "              |
| 22°00                    | 45        | 23     | 3         | " 25, '13     | 49.2         | "              |
| At                       | 45        | 23     | 3         | " 18, '13     | 24 45.8      | "              |
| At                       | 45        | 23     | 3         | " 18, '13     | 46.7         | "              |
| At                       | 45        | 23     | 3         | " 18, '13     | 45.6         | "              |
| At                       | 48        | 23     | 3         | Sept. 18, '13 | 38.9         | "              |
| 18°00 S.-                | 48        | 23     | 3         | " 18, '13     | 40.1         | "              |
| At SE.                   | 48        | 23     | 3         | " 10, '13     | 41.9         | "              |
| At SE.                   | 48        | 23     | 3         | " 10, '13     | 41.8         | "              |
| At SE.                   | 48        | 23     | 3         | " 10, '13     | 42.9         | "              |
| 5°00 S.-                 | 51        | 23     | 3         | Oct. 23, '14  | 41.7         | J. M. Coté.    |
| At                       | 52        | 23     | 3         | " 1, '14      | 46.4         | E. P. Bowman.  |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                                 | Township. | Range. | Meridian. | Date.         | Declination. | Observer.      |
|--|-----------|--------|-----------|---------------|--------------|----------------|
| 41° 00' E.-NE. cor. sec. 8             | 52        | 23     | 3         | Oct. 7, '14   | 45° 8'       | E. P. Bowman.  |
| At                                     | 19        | 21     | 3         | June 27, '14  | 22 45° 2'    | G. A. Bennett. |
| 30° 00' N.-                            | 19        | 23     | 3         | July 1, '14   | 51° 3'       | "              |
| 1° 00' N.-                             | 30        | 24     | 3         | Aug. 12, '14  | 24 28° 8'    | "              |
| 30° 00' S.-                            | 17        | 24     | 3         | Sept 25, '14  | 17° 4'       | J. M. Coté.    |
| 14° 00' S.-                            | 51        | 24     | 3         | " 26, '14     | 27° 2'       | "              |
| 8° 00' S.-                             | 51        | 24     | 3         | " 28, '14     | 25° 8'       | "              |
| 25° 00' E.-SE                          | 51        | 24     | 3         | Oct. 6, '14   | 42° 3'       | "              |
| 30° 00' E.-                            | 51        | 24     | 3         | " 7, '14      | 40° 2'       | "              |
| 20° 00' N.-                            | 51        | 24     | 3         | " 7, '14      | 37° 1'       | "              |
| 5° 00' N.-NE                           | 9         | 24     | 3         | " 28, '14     | 25° 6'       | "              |
| 40° 00' W.-                            | 51        | 24     | 3         | Nov. 3, '14   | 33° 5'       | "              |
| 20° 00' N.-                            | 22        | 24     | 3         | " 10, '14     | 28° 5'       | "              |
| 60° 66' S.-                            | 14        | 24     | 3         | Sept. 20, '14 | 16° 6'       | E. P. Bowman.  |
| 0° 50' E.-                             |           |        |           |               |              |                |
| *6° 72' W.-                            | 31        | 25     | 3         | Aug. 25, '14  | 21 56° 9'    | A. G. Stuart.  |
| *6° 72' W.-                            | 31        | 25     | 3         | " 25, '14     | 58° 1'       | "              |
| 8° 00' N.-NE                           | 11        | 25     | 3         | July 29, '14  | 22 59° 4'    | G. C. Cowper.  |
| 10° 00' N.-                            | 11        | 25     | 3         | " 31, '14     | 23 02° 4'    | "              |
| At N.-                                 | 17        | 25     | 3         | June 29, '14  | 22 19° 7'    | "              |
| 4° 00' E.-                             | 34        | 25     | 3         | Aug. 10, '14  | 56° 5'       | G. A. Bennett. |
| At E.-                                 | 30        | 25     | 3         | " 11, '14     | 23 01° 4'    | "              |
| 40° 00' N.-                            | 13        | 25     | 3         | " 13, '14     | 22 36° 4'    | "              |
| 45° 00' N.-                            | 2         | 26     | 3         | July 7, '14   | 53° 8'       | "              |
| At N.-                                 | 29        | 26     | 3         | Aug. 1, '14   | 23 55° 4'    | "              |
| 26° 00' S.-                            | 18        | 26     | 3         | " 5, '14      | 24 29° 3'    | "              |
| 43° 32' W.-                            | 31        | 27     | 3         | " 27, '14     | 22 04° 1'    | A. G. Stuart.  |
| 43° 32' W.-                            | 31        | 27     | 3         | " 27, '14     | 03° 9'       | "              |
| 43° 32' W.-                            | 31        | 27     | 3         | " 27, '14     | 02° 7'       | "              |
| At W.-                                 | 15        | 27     | 3         | June 30, '14  | 45° 7'       | G. C. Cowper.  |
| At W.-                                 | 15        | 27     | 3         | July 1, '14   | 44° 5'       | "              |
| 44° 00' S.-                            | 25        | 27     | 3         | Aug. 5, '14   | 24 38° 5'    | G. A. Bennett. |
| 31° 00' N.-                            | 24        | 27     | 3         | " 4, '14      | 22° 4'       | "              |
| At N.-                                 | 13        | 28     | 3         | June 14, '14  | 22 18° 2'    | G. C. Cowper.  |
| 49° 00' W.-                            | 16        | 28     | 3         | " 16, '14     | 21° 2'       | "              |
| 37° 00' S.-                            |           |        |           |               |              |                |
| 5° 00' S.-                             | 25        | 28     | 3         | " 26, '14     | 12° 5'       | "              |
| At S.-                                 | 9         | 28     | 3         | July 2, '14   | 40° 4'       | "              |
| 10° 25' SW. of Wit. I. P. T. 11, N.-NE | 22        | 28     | 3         | " 10, '14     | 23 51° 9'    | G. A. Bennett. |
| 56° 00' S.- NE cor. sec.               | 31        | 28     | 3         | " 21, '14     | 24 16° 4'    | "              |
| At S.-                                 | 7         | 28     | 3         | " 25, '14     | 23 19° 9'    | "              |
| 28° 50' W.-                            | 21        | 29     | 3         | " 11, '14     | 22 43° 3'    | G. C. Cowper.  |
| 21° 00' S.-                            |           |        |           |               |              |                |
| 50° 00' S.-                            | 29        | 29     | 3         | " 7, '14      | 23 07° 8'    | "              |
| 35° 00' S.-                            | 21        | 29     | 3         | " 4, '14      | 03° 2'       | "              |
| 50° 00' S.-                            | 27        | 29     | 3         | " 22, '14     | 51° 0'       | G. A. Bennett. |
| 50° 00' S.-                            | 27        | 29     | 3         | " 30, '14     | 24 08° 8'    | "              |
| 10° 00' S.-                            | 7         | 1      | 4         | Sept. 6, '14  | 21 51° 0'    | A. G. Stuart.  |
| 10° 00' S.-                            | 7         | 1      | 4         | " 6, '14      | 50° 7'       | "              |
| 10° 00' S.-                            | 7         | 1      | 4         | " 6, '14      | 49° 0'       | "              |
| At                                     | 12        | 1      | 4         | Dec. 10, '14  | 54° 1'       | M. H. Baker.   |
| 5° 00' S.-                             | 15        | 1      | 4         | Oct. 14, '14  | 23 47° 3'    | A. G. Stuart.  |
| 5° 00' S.-                             | 15        | 1      | 4         | " 14, '14     | 46° 3'       | "              |
| 15° 00' S.-                            | 36        | 1      | 4         | Nov. 15, '14  | 24° 2'       | "              |
| At                                     | 16        | 1      | 4         | Oct. 30, '14  | 15° 1'       | M. H. Baker.   |
| 20° 00' N.-                            | 16        | 1      | 4         | " 31, '14     | 17° 0'       | "              |
| 10° 00' N.-                            | 19        | 1      | 4         | " 18, '14     | 29 02° 2'    | A. G. Stuart.  |
| 10° 00' N.-                            | 13        | 1      | 4         | " 18, '14     | 28 47° 4'    | "              |
| 10° 00' N.-                            | 13        | 1      | 4         | " 18, '14     | 29 01° 1'    | "              |
| 10° 00' N.-                            | 13        | 1      | 4         | " 18, '14     | 01° 0'       | "              |
| 10° 00' N.-                            | 13        | 1      | 4         | " 18, '14     | 28 54° 5'    | "              |
| 2° 00' S.-                             | 36        | 1      | 4         | " 25, '14     | 31 31° 0'    | "              |
| 2° 00' S.-                             | 36        | 1      | 4         | " 25, '14     | 31° 3'       | "              |



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place.                   | Township. | Range. | Meridian. | Date.         | Declination. | Observer.      |
|--------------------------|-----------|--------|-----------|---------------|--------------|----------------|
| 2°00 S.-NE. cor. sec. 36 | 22        | 1      | 4         | Oct. 25, '14  | 28.8         | A. G. Stuart.  |
| 11°84 S.-" 36            | 24        | 1      | 4         | " 28, '14     | 35 29.7      | "              |
| 11°84 S.-" 36            | 22        | 1      | 4         | " 28, '14     | 22.6         | "              |
| 11°84 S.-" 36            | 22        | 1      | 4         | " 28, '14     | 22.0         | "              |
| 40°00 S.-" 36            | 32        | 1      | 4         | Nov. 8, '14   | 32 07.5      | "              |
| 40°00 S.-" 36            | 32        | 1      | 4         | " 8, '14      | 09.9         | "              |
| 40°00 S.-" 36            | 32        | 1      | 4         | " 8, '14      | 07.9         | "              |
| At " 34                  | 80        | 1      | 4         | May 7, '13    | 25 24.9      | F. V. Seibert. |
| 5°00 S.-" 25             | 20        | 2      | 4         | April 30, '14 | 23 12.1      | J. M. Côté.    |
| 5°00 W.-" 33             | 80        | 2      | 4         | May 12, '14   | 25 50.0      | F. V. Seibert. |
| At " 31                  | 24        | 2      | 4         | " 14, '13     | 13.7         | "              |
| At " 19                  | 28        | 3      | 4         | July 18, '14  | 23 30.8      | G. A. Bennett. |
| 20°00 E.-" 24            | 42        | 3      | 4         | Aug. 24, '14  | 45.9         | O. B. Roberts. |
| 14°00 W.-" 36            | 20        | 3      | 4         | May 15, '13   | 25 20.9      | F. V. Seibert. |
| 50°00 W.-" 35            | 80        | 3      | 4         | " 16, '13     | 19.4         | "              |
| 45°00 W.-" 34            | 80        | 3      | 4         | " 17, '13     | 14.6         | "              |
| 10°00 E.-" 31            | 80        | 3      | 4         | " 29, '13     | 25 13.0      | "              |
| 40°00 N.-" 2             | 14        | 5      | 4         | Oct. 14, '14  | 22 19.4      | M. H. Baker.   |
| 2°00 N.-" 23             | 14        | 5      | 4         | " 14, '14     | 05.8         | "              |
| 40°00 W.-" 35            | 15        | 5      | 4         | " 29, '14     | 23 31.4      | "              |
| 23°00 E.-" 34            | 80        | 5      | 4         | May 29, '13   | 27 10.7      | F. V. Seibert. |
| 5°00 S.-" 24             | 17        | 6      | 4         | Nov. 24, '14  | 24 12.9      | M. H. Baker.   |
| 40°00 S.-" 23            | 35        | 6      | 4         | Aug. 27, '14  | 28.6         | O. B. Roberts. |
| At " 8                   | 42        | 6      | 4         | " 20, '11     | 24.1         | "              |
| At " 21                  | 4         | 7      | 4         | July 11, '14  | 22 27.5      | J. M. Cote.    |
| 40°00 S.-" 15            | 35        | 7      | 4         | Sept. 4, '14  | 24 00.1      | O. B. Roberts. |
| 39°00 W.-" 31            | 80        | 7      | 4         | June 13, '13  | 30 07.3      | F. V. Seibert. |
| At Station 2, Sec. 7     | 43        | 8      | 4         | Oct. 9, '14   | 25 42.0      | G. W. Coltham. |
| 20°00 S.-NE cor. sec. 23 | 20        | 9      | 4         | Nov. 18, '14  | 23 39.2      | M. H. Baker.   |
| At " 22                  | 35        | 9      | 4         | Sept. 11, '14 | 24 07.6      | O. B. Roberts. |
| 40°00 S., " 18           | 39        | 9      | 4         | June 29, '14  | 25 28.8      | "              |
| At " 7                   | 40        | 9      | 4         | " 25, '14     | 24.5         | "              |
| At ½ cor. E. by sec. 31  | 41        | 9      | 4         | " 10, '14     | 25.5         | "              |
| 13°00 E.-NE cor. sec. 11 | 42        | 9      | 4         | " 7, '14      | 38.0         | "              |
| At Station 4, sec. 7     | 43        | 9      | 4         | Sept. 30, '14 | 25.8         | G. W. Coltham. |
| At NE cor. sec. 16       | 45        | 9      | 4         | Aug. 7, '14   | 25.0         | "              |
| At Station 4, sec. 26    | 46        | 9      | 4         | " 1, '14      | 21.9         | "              |
| At Station 4, sec. 23    | 47        | 9      | 4         | July 31, '14  | 30.5         | "              |
| 15°00 S.-NE cor. sec. 5  | 22        | 10     | 4         | June 18, '14  | 23 28.2      | J. M. Cote.    |
| 15°00 N.-" 10            | 22        | 10     | 4         | " 19, '14     | 32.9         | "              |
| At " 13                  | 22        | 10     | 4         | " 24, '14     | 35.6         | "              |
| At " 12                  | 35        | 10     | 4         | Sept. 12, '14 | 24 14.3      | O. B. Roberts. |
| At " 7                   | 39        | 10     | 4         | July 2, '14   | 25 28.4      | "              |
| At " 17                  | 40        | 10     | 4         | " 13, '14     | 22.1         | "              |
| At " 6                   | 41        | 10     | 4         | " 14, '14     | 17.4         | "              |
| 20°00 S.-" 36            | 42        | 10     | 4         | June 2, '14   | 25.9         | "              |
| At " 7                   | 42        | 10     | 4         | July 23, '14  | 29.1         | "              |
| At Sta. 3, sec. 32       | 44        | 10     | 4         | Aug. 17, '14  | 25 26.3      | G. W. Coltham. |
| At Sta. 50, sec. 34      | 45        | 10     | 4         | July 21, '14  | 02.1         | "              |
| 1°00 W.-NE cor. sec. 33  | 46        | 10     | 4         | Aug. 3, '14   | 06.0         | "              |
| At Sta. 5, sec. 33       | 47        | 10     | 4         | July 7, '14   | 24 54.5      | "              |
| 10°00 S.-NE cor. sec. 2  | 21        | 11     | 4         | May 17, '14   | 23 26.1      | J. M. Côté.    |
| 15°00 S.-" 7             | 21        | 11     | 4         | " 20, '14     | 18.9         | "              |
| 57°00 S.-" 3             | 21        | 11     | 4         | " 9, '14      | 33.3         | "              |
| At " 11                  | 39        | 11     | 4         | July 4, '14   | 25 22.6      | O. B. Roberts. |
| At " 21                  | 40        | 11     | 4         | " 9, '14      | 20.3         | "              |
| At " 23                  | 40        | 11     | 4         | " 10, '14     | 05.7         | "              |
| At " 27                  | 41        | 11     | 4         | " 21, '14     | 19.1         | "              |
| At " 33                  | 41        | 11     | 4         | " 25, '14     | 27.1         | "              |
| 2°00 E.-" 11             | 42        | 11     | 4         | " 27, '14     | 32.4         | "              |
| 20°00 N.-" 12            | 43        | 11     | 4         | Sept. 19, '14 | 32.4         | G. W. Coltham. |
| At Sta. 3, sec. 2        | 43        | 11     | 4         | " 25, '14     | 17.6         | "              |
| At Sta. 2, sec. 26       | 44        | 11     | 4         | Aug. 17, '14  | 23.6         | "              |
| At Sta. 2, sec. 6        | 44        | 11     | 4         | Sept 17, '14  | 30.9         | "              |



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## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                   | Township. | Range. | Meridian. | Date.         | Declination. | Observer.       |
|--------------------------|-----------|--------|-----------|---------------|--------------|-----------------|
| At Sta. 3, sec. 1        | 45        | 11     | 4         | Aug. 16, '14  | 12.1         | G. W. Coltham.  |
| 50.00 S. NE cor. sec. 1  | 45        | 11     | 4         | Aug. 17, '14  | 15.5         | "               |
| 30.00 N. " 7             | 46        | 11     | 4         | July 17, '14  | 18.7         | "               |
| 10.00 W. " 33            | 47        | 11     | 4         | June 15, '14  | 26 03.6      | "               |
| At " 33                  | 47        | 11     | 4         | " 29, '14     | 06.5         | "               |
| 30.00 S. " 16            | 47        | 11     | 4         | July 3, '14   | 25 37.0      | "               |
| 68.00 W. " 34            | 80        | 11     | 4         | " 3, '13      | 29 46.5      | F. V. Seibert.  |
| 40.00 W. " 20            | 9         | 12     | 4         | Dec. 4, '14   | 22 06.4      | M. H. Baker.    |
| 2.00 S. " 1              | 22        | 12     | 4         | May 23, '14   | 23 27.1      | J. M. Côté.     |
| 38.00 W. " 34            | 22        | 12     | 4         | May 30, '14   | 55.4         | "               |
| 2.00 N. " 8              | 22        | 12     | 4         | June 5, '14   | 09.7         | "               |
| At " 16                  | 39        | 12     | 4         | July 4, '14   | 25 20.8      | O. B. Roberts.  |
| 40.00 S. " 17            | 40        | 12     | 4         | " 7, '14      | 17.3         | "               |
| At " 20                  | 41        | 12     | 4         | " 21, '14     | 23.5         | "               |
| 40.00 S. " 24            | 41        | 12     | 4         | " 22, '14     | 22.7         | "               |
| At " 17                  | 42        | 12     | 4         | " 24, '14     | 25 16.8      | "               |
| At Sta. 2, sec. 8        | 44        | 12     | 4         | Sept. 19, '14 | 42.4         | G. W. Coltham.  |
| At Sta. 6, sec. 14       | 45        | 12     | 4         | Aug. 26, '14  | 29.9         | "               |
| At NE. cor. sec. 17      | 60        | 12     | 4         | Oct. 10, '14  | 26 33.4      | H. M. R. Soars. |
| 6.00 W.-NE. cor. sec. 31 | 92        | 12     | 4         | July 31, '14  | 30 24.5      | G. H. Blanchet. |
| At NE. cor. sec. 24      | 22        | 13     | 4         | June 10, '14  | 23 31.1      | J. M. Côté.     |
| At " 25                  | 40        | 13     | 4         | Aug. 17, '14  | 25 28.1      | O. B. Roberts.  |
| At " 12                  | 41        | 13     | 4         | " 15, '14     | 20.7         | "               |
| At Sta. 4, Lake No. 1    | 44        | 13     | 4         | Sept. 16, '14 | 28.0         | G. W. Coltham.  |
| At Sta. 2, sec. 24       | 45        | 13     | 4         | Aug. 25, '14  | 46.3         | "               |
| 5.00 N.-NE. cor. sec. 24 | 46        | 13     | 4         | " 30, '14     | 26 08.7      | "               |
| 47.00 W. " 36            | 80        | 13     | 4         | July 19, '13  | 30 44.5      | F. V. Seibert.  |
| 42.00 W. " 31            | 92        | 13     | 4         | Aug. 6, '14   | 36.3         | G. H. Blanchet. |
| 1.04 W. " 35             | 96        | 13     | 4         | May 19, '14   | 55.4         | "               |
| 11.20 W. " 32            | 96        | 13     | 4         | " 25, '14     | 31 45.3      | "               |
| At " 19                  | 37        | 14     | 4         | Sept. 21, '14 | 25 32.5      | O. B. Roberts.  |
| At " 34                  | 38        | 14     | 4         | " 24, '14     | 30.4         | "               |
| At " 29                  | 41        | 14     | 4         | Aug. 12, '14  | 20.5         | "               |
| 11.00 S. " 3             | 41        | 14     | 4         | Oct. 6, '14   | 37.6         | M. H. Baker.    |
| At " 35                  | 42        | 14     | 4         | Aug. 11, '14  | 27.0         | O. B. Roberts.  |
| *30.00 N. " 29           | 44        | 14     | 4         | Sept. 5, '14  | 23.7         | G. W. Coltham.  |
| 40.00 W. " 34            | 46        | 14     | 4         | " 1, '14      | 42.7         | "               |
| 10.00 E.-SE. cor. sec. 3 | 47        | 14     | 4         | Aug. 31, '14  | 40.9         | "               |
| 38.00 W.-NE " 36         | 80        | 14     | 4         | " 1, '13      | 29 24.4      | F. V. Seibert.  |
| 7.00 W. " 33             | 80        | 14     | 4         | Aug. 5, '13   | 08.5         | "               |
| 46.00 W. " 31            | 92        | 14     | 4         | " 17, '14     | 31 05.9      | G. H. Blanchet. |
| At " 30                  | 7         | 15     | 4         | July 13, '14  | 23 07.6      | W. J. Boulton.  |
| 40.00 W. " 7             | 8         | 15     | 4         | " 14, '14     | 23 23.3      | "               |
| 40.00 W. " 7             | 9         | 15     | 4         | " 21, '14     | 52.6         | "               |
| 40.00 N. " 5             | 10        | 15     | 4         | " 2, '14      | 22 44.4      | "               |
| At " 7                   | 38        | 15     | 4         | Sept 29, '14  | 25 24.3      | J. B. Roberts.  |
| At NE. cor. sec. 23      | 41        | 15     | 4         | Aug. 5, '14   | 25 32.1      | O. B. Roberts.  |
| At " 4                   | 42        | 15     | 4         | " 4, '14      | 23.6         | "               |
| 49.87 W. " 35            | 86        | 15     | 4         | June 4, '14   | 30 26.1      | G. H. Blanchet. |
| 63.75 W. " 27            | 7         | 16     | 4         | July 9, '14   | 23 07.6      | W. J. Boulton.  |
| 63.75 W. " 27            | 7         | 16     | 4         | " 12, '14     | 22 37.6      | "               |
| At " 31                  | 8         | 16     | 4         | Sept. 21, '14 | 23 44.9      | "               |
| At " 23                  | 9         | 16     | 4         | " 21, '14     | 28.3         | "               |
| 40.00 S. " 18            | 10        | 16     | 4         | " 21, '14     | 20.3         | "               |
| 43.00 N. " 15            | 34        | 16     | 4         | Oct. 28, '14  | 24 47.0      | G. A. Bennett.  |
| 43.00 N. " 15            | 34        | 16     | 4         | " 28, '14     | 48.1         | "               |
| 40.00 W. " 10            | 34        | 16     | 4         | " 29, '14     | 32.3         | "               |
| At " 12                  | 38        | 16     | 4         | " 1, '14      | 25 27.3      | O. B. Roberts.  |
| At " 32                  | 41        | 16     | 4         | July 29, '14  | 38.4         | "               |
| At " 35                  | 42        | 16     | 4         | " 31, '14     | 24.4         | "               |
| At " 36                  | 80        | 16     | 4         | Aug. 19, '13  | 30 03.9      | F. V. Seibert.  |
| 12.00 W. " 32            | 80        | 16     | 4         | " 27, '13     | 08.1         | "               |
| 40.38 W. " 35            | 92        | 16     | 4         | " 23, '14     | 36.9         | G. H. Blanchet. |
| 3.00 W. " 31             | 93        | 16     | 4         | June 11, '14  | 31 54.4      | "               |



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.   | Township. | Range. | Meridian. | Date.         | Declination. | Observer.       |
|--|-----------|--------|-----------|---------------|--------------|-----------------|
| 40°00 N.-NE. cor. sec. 26.....                         | 7         | 17     | 4         | July 14, '14  | 22 50·9      | W. J. Boulton.  |
| At SE. " 3.....  | 7         | 17     | 4         | " 22, '14     | 23 00 4      | "               |
| 27°47 W. 8. 74 S. NE cor. sec. 9.....                  | 8         | 17     | 4         | " 16, '14     | 01·5         | "               |
| 27°47 W. 8. 74 S. " 9.....                             | 8         | 17     | 4         | " 17, '14     | 22 58·1      | "               |
| At " 19.....   | 9         | 17     | 4         | Aug. 3, '14   | 23 13·4      | "               |
| 13°11 W. 27°22 S.-NE. cor-sec. 8. ....                 | 10        | 17     | 4         | " 29, '14     | 14·5         | "               |
| 32°37 S. 5°57 W.- " 11.....                            | 10        | 17     | 4         | Sept. 11, '14 | 27·0         | "               |
| At NE. cor. sec. 5.....                                | 11        | 17     | 4         | " 23, '14     | 15·7         | "               |
| 48°00 S.- " 3.....                                     | 12        | 17     | 4         | " 23, '14     | 49 7         | "               |
| 3°00 N.- " 19.....                                     | 34        | 17     | 4         | Oct. 30, '14  | 24 21·9      | G. A. Bennett.  |
| 3°00 N.- " 5.....                                      | 37        | 17     | 4         | Nov. 7, '14   | 47·5         | "               |
| At " 2.....  | 38        | 17     | 4         | Oct. 5, '14   | 25 34·1      | O. B. Roberts.  |
| At " 10.....   | 39        | 17     | 4         | " 7, '14      | 25 32 3      | "               |
| At " 23.....   | 42        | 17     | 4         | Aug. 1, '14   | 19·3         | "               |
| At Sta. 83, Beaver Hills, traverse NE. 28              | 51        | 17     | 4         | Oct. 7, '14   | 26 32·4      | H. M. R. Soars. |
| At Sta. 47, " Lake, sec. 7....                         | 53        | 17     | 4         | Sept. 19, '14 | 24·1         | "               |
| Cor. of Lots 1, 2, 13 and 14, Block 2....              | 78        | 17     | 4         | Aug. 28, '14  | 28 31·1      | S. D. Fawcett.  |
| " " 1, 2, 13 and 14, " 2....                           | 78        | 17     | 4         | " 29, '14     | 40·7         | "               |
| 70°00 W.-NE. cor. sec. 32.....                         | 80        | 17     | 4         | Sept. 5, '13  | 30 24·2      | F. V. Seibert   |
| 20°00 W.- " 36.....                                    | 92        | 17     | 4         | Aug. 26, '14  | 31 04·2      | G. H. Blanchet. |
| 24°00 W.- " 36.....                                    | 96        | 17     | 4         | June 12, '14  | 21·1         | "               |
| 28°00 E.- " 31.....                                    | 8         | 18     | 4         | " 27, '14     | 23 14·6      | W. J. Boulton.  |
| At " 9.....  | 9         | 18     | 4         | Aug 3, '14    | 09·0         | "               |
| 35°10 N. 26°62 E.-NE. cor. SE. $\frac{1}{4}$ , sec. 22 | 10        | 18     | 4         | Sept, 3, '14  | 19·2         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 14·7         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 13 1         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 08 5         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 07·9         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 06·5         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 05 7         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 06 3         | "               |
| 63°80 E. 24°60 N.- " " " 22                            | 10        | 18     | 4         | " 4, '14      | 06·9         | "               |
| 40°00 S.-NE. cor. sec. 8.....                          | 11        | 18     | 4         | Aug. 31, '14  | 32·4         | "               |
| 32°00 N.- " 24.....                                    | 34        | 18     | 4         | Oct. 30, '14  | 24 22·0      | G. A. Bennett.  |
| At Sta. 14, Beaver Lake sec. 32....                    | 51        | 18     | 4         | Sept. 2, '14  | 26 22·0      | H. M. R. Soars. |
| At Sta. 8, " " 19.....                                 | 51        | 18     | 4         | " 4, '14      | 19·4         | "               |
| At Sta. 20, " " 52.....                                | 52        | 18     | 4         | " 3, '14      | 18·3         | "               |
| 19°00 E.- $\frac{1}{4}$ on E. by. sec. 28.....         | 52        | 18     | 4         | " 16, '14     | 32·2         | "               |
| 40°00 W. $\frac{1}{4}$ " " 35.....                     | 53        | 18     | 4         | " 26, '14     | 30 6         | "               |
| 33°23 W.-NE. cor. sec. 31.....                         | 96        | 18     | 4         | June 20, '14  | 30 21·9      | G. H. Blanchet  |
| 78°43 W.-58°00 N.-NE. cor. sec. 12...                  | 9         | 19     | 4         | July 29, '14  | 23 10·4      | W. J. Boulton.  |
| 33°00 W.-NE. cor. sec. 22.....                         | 9         | 19     | 4         | Aug. 1, '14   | 08·6         | "               |
| At NE. " 20.....                                       | 9         | 19     | 4         | " 1, '14      | 12·0         | "               |
| 78°43 W. 58°00 N.-NE. cor. sec. 12...                  | 9         | 19     | 4         | " 4, '14      | 11·5         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 12·7         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 11·1         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 11·5         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 10·7         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 13·3         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 14·7         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 14·5         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 15·5         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 16·9         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 13·1         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 12·1         | "               |
| 78°43 W. 58°00 " 12....                                | 9         | 19     | 4         | " 4, '14      | 10·1         | "               |
| 40°00 E.-NE. cor. sec. 34 .. .. .                      | 35        | 19     | 4         | Oct. 14, '14  | 25 19·0      | O. B. Roberts.  |
| 14°00 S. " 13.....                                     | 38        | 19     | 4         | Nov. 10, '14  | 22·8         | G. A. Bennett.  |
| 40°00 S.- " 5.....                                     | 39        | 19     | 4         | Oct. 10, '14  | 23 5         | O. B. Roberts.  |
| At Sta. 15, Dry Grass Lake, sec. 21....                | 53        | 19     | 4         | Sept. 23, '14 | 27 00·7      | H. M. R. Soars. |
| At Sta. 8, Goose lake, sec. 7.....                     | 53        | 19     | 4         | " 23, '14     | 26 35·3      | "               |
| 12°00 W.-NE. cor. sec. 10.....                         | 54        | 19     | 4         | Aug. 4, '14   | 27 10·9      | J. M. Côté      |
| 20°00 S.- " 2.....                                     | 54        | 19     | 4         | " 12, '14     | 26 44·0      | "               |
| 25°00 S.- " 21.....                                    | 54        | 19     | 4         | " 26, '14     | 27 01·4      | "               |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.  | Township. | Range. | Meridian. | Date.         | Declination. | Observer.        |
|---|-----------|--------|-----------|---------------|--------------|------------------|
| 4°00 E.-NE. cor. sec. 31 .....                    | 54        | 19     | 4         | Aug. 29, '14  | 26 52.7      | J. M. Coté.      |
| *35°00 E.-" 21 .....                              | 54        | 19     | 4         | Sept. 5, '14  | 27 05.4      | "                |
| 30°00 E.- $\frac{1}{4}$ post E. by sec. 30 .....  | 57        | 19     | 4         | Oct. 13, '14  | 26 38.6      | H. M. R. Soars.  |
| 74°18 W.-NE. cor. sec. 36 .....                   | 80        | 19     | 4         | Jan. 19, '14  | 30 31.1      | F. V. Seibert.   |
| 67°06 W.-" 31 .....                               | 82        | 19     | 4         | Sept. 10, '14 | 27.5         | G. H. Blanchet.  |
| 40°00 W.-" 24 .....                               | 8         | 20     | 4         | Aug. 13, '14  | 23 06.1      | W. J. Boulton.   |
| 40°00 S.-" 25 .....                               | 9         | 20     | 4         | " 15, '14     | 27.3         | "                |
| At Sta. 15, traverse Hastings lake, sec. 21 ..... | 51        | 20     | 4         | " 11, '14     | 25 26.4      | H. M. R. Soars.  |
| At Sta. 48, traverse Hastings lake, sec. 21 ..... | 51        | 20     | 4         | " 19, '14     | 33.5         | "                |
| *At Sta. 11, Wanisan lake, sec. 8 .....           | 52        | 20     | 4         | " 24, '14     | 27.6         | "                |
| 29°00 E.-NW. cor. sec. 17 .....                   | 70        | 20     | 4         | Oct. 31, '14  | 28 52.4      | Wm. Christie.    |
| 50°00 N.-SE. cor. sec. 5 .....                    | 71        | 20     | 4         | Sept. 17, '14 | 29 00.3      | "                |
| 60°00 E.-NW " 32 .....                            | 71        | 20     | 4         | " 22, '14     | 28 53.7      | "                |
| 1°32 W.-NE " 31 .....                             | 80        | 20     | 4         | Jan. 24, '14  | 29 14.6      | F. V. Seibert.   |
| 7°26 W.-" 36 .....                                | 96        | 20     | 4         | June 29, '14  | 29 47.0      | G. H. Blanchet.  |
| At $\frac{1}{4}$ post on N. by sec. 9 .....       | 51        | 21     | 4         | Aug. 4, '14   | 26 50.0      | H. M. R. Soars.  |
| " 9 .....   | 51        | 21     | 4         | " 10, '14     | 35.4         | "                |
| " 9 .....   | 51        | 21     | 4         | " 10, '14     | 35.7         | "                |
| " 9 .....   | 51        | 21     | 4         | " 12, '14     | 45.6         | "                |
| " 9 .....   | 51        | 21     | 4         | " 18, '14     | 28.5         | "                |
| " 9 .....   | 51        | 21     | 4         | " 18, '14     | 25.1         | "                |
| " 9 .....   | 51        | 21     | 4         | " 19, '14     | 52.3         | "                |
| At Sta. 13, Cooking lake traverse .....           | 52        | 21     | 4         | July 13, '14  | 27 01.8      | "                |
| " .....   | 52        | 21     | 4         | " 9, '14      | 26 36.9      | "                |
| " .....   | 52        | 21     | 4         | " 15, '14     | 52.0         | "                |
| " .....   | 52        | 21     | 4         | " 21, '14     | 47.1         | "                |
| " .....   | 52        | 21     | 4         | " 22, '14     | 52.0         | "                |
| " .....   | 52        | 21     | 4         | " 20, '14     | 42.4         | "                |
| 39°00 N.-SE. cor. sec. 25 .....                   | 70        | 21     | 4         | Aug. 28, '14  | 28 46.8      | Wm. Christie.    |
| 22°00 S.-NE " 30 .....                            | 70        | 21     | 4         | Oct. 13, '14  | 29 09.7      | "                |
| 55°00 S.-" 21 .....                               | 70        | 21     | 4         | " 21, '14     | 69.3         | "                |
| 30°00 S.-" 14 .....                               | 70        | 21     | 4         | " 31, '14     | 28 38.9      | "                |
| 30°00 E.-NW " 32 .....                            | 71        | 21     | 4         | Aug. 10, '14  | 39.7         | "                |
| 2°00 N.-NE " 27 .....                             | 71        | 21     | 4         | " 15, '14     | 58.0         | "                |
| 8°00 E.-SW " 4 .....                              | 71        | 21     | 4         | " 19, '14     | 29 03.8      | "                |
| 10°62 W.-" 36 .....                               | 92        | 21     | 4         | Sept. 16, '14 | 30 19.5      | G. H. Blanchet.  |
| At " 23 .....                                     | 51        | 22     | 4         | July 30, '14  | 26 26.1      | H. M. R. Soars.  |
| 30°00 E.-" 20 .....                               | 52        | 22     | 4         | " 1, '14      | 29.5         | "                |
| 65°00 N.-" 22 .....                               | 52        | 22     | 4         | June 21, '14  | 49.2         | "                |
| At " 4 .....                                      | 70        | 22     | 4         | " 6, '14      | 28 42.8      | Wm. Christie.    |
| 20°00 N.-SE. " 28 .....                           | 70        | 22     | 4         | " 11, '14     | 44.4         | "                |
| 30°00 S.-NE " 32 .....                            | 71        | 22     | 4         | July 3, '14   | 30.9         | "                |
| At " 22 .....                                     | 71        | 22     | 4         | July 8, '14   | 29 24.5      | "                |
| At " 6 .....                                      | 72        | 22     | 4         | Aug. 13, '14  | 28 38.5      | "                |
| 72°44 W.-" 34 .....                               | 80        | 22     | 4         | Jan. 31, '14  | 29 09.9      | F. V. Seibert.   |
| 18°50 W.-" 35 .....                               | 96        | 22     | 4         | Oct. 17, '14  | 30 37.6      | G. H. Blanchet.  |
| 5°00 S.-" 14 .....                                | 40        | 23     | 4         | Jan. 1, '14   | 25 38.2      | J. B. Saint Cyr. |
| At SE. " 29 .....                                 | 52        | 23     | 4         | June 9, '14   | 26 45.1      | H. M. R. Soars.  |
| 0°39 W.-NE. " 32 .....                            | 80        | 23     | 4         | Feb. 9, '14   | 29 14.5      | F. V. Seibert.   |
| 40°48 W.-" 32 .....                               | 84        | 23     | 4         | Jan. 14, '14  | 49.3         | G. H. Blanchet.  |
| 27°44 W.-" 34 .....                               | 92        | 23     | 4         | Sept. 29, '14 | 30 18.5      | "                |
| 60°35 W.-" 31 .....                               | 96        | 23     | 4         | Oct. 23, '14  | 31 08.2      | "                |
| 58°32 W.-" 35 .....                               | 80        | 24     | 4         | Feb. 12, '14  | 28 41.4      | F. V. Seibert.   |
| 32°43 W.-" 34 .....                               | 84        | 24     | 4         | Jan. 19, '14  | 29 29.7      | G. H. Blanchet.  |
| 51°31 W.-" 34 .....                               | 92        | 24     | 4         | Oct. 1, '14   | 30 29.7      | "                |
| 31°00 S.-" 15 .....                               | 37        | 25     | 4         | Nov. 21, '14  | 25 32.2      | G. A. Bennett.   |
| 39°00 S.-" 15 .....                               | 37        | 25     | 4         | " 21, '14     | 38.6         | "                |
| 5°00 W.-" 36 .....                                | 80        | 25     | 4         | Feb. 18, '14  | 30 23.5      | F. V. Seibert.   |
| 76°40 W.-" 32 .....                               | 80        | 25     | 4         | " 21, '14     | 14.5         | "                |
| 35°85 W.-" 31 .....                               | 84        | 25     | 4         | Jan. 27, '14  | 50.4         | G. H. Blanchet.  |
| 53°00 W.-" 35 .....                               | 80        | 26     | 4         | Feb. 23, '14  | 29 58.5      | F. V. Seibert.   |
| 20°00 N.-" 14 .....                               | 17        | 27     | 4         | Aug. 19, '14  | 25 38.4      | J. A. Calder.    |



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.  | Township.   | Range. | Meridian. | Date.         | Declination. | Observer.        |
|---|-------------|--------|-----------|---------------|--------------|------------------|
|   |             |        |           |               | ° "          |                  |
| 5.00 N.-NE. cor. sec. 13 .....                              | 17          | 27     | 4         | Aug. 21, '14  | 26 28.1      | J. A. Calder.    |
| 36.00 W.- " 21 .....  | 17          | 27     | 4         | " 22, '14     | 25 14.3      | "                |
| 40.25 S.- " 22 .....  | 17          | 27     | 4         | " 26, '14     | 24 48.2      | "                |
| At " 2 .....  | 64          | 27     | 4         | Dec. 21, '13  | 27 52.5      | A. L. Cumming.   |
| At " 2 .....  | 64          | 27     | 4         | " 21, '13     | 52.0         | "                |
| At " 2 .....  | 64          | 27     | 4         | " 21, '13     | 50.6         | "                |
| 17.50 W.-SE. " 4 .....                                      | 35          | 28     | 4         | Nov. 16, '14  | 25 20.6      | G. A. Bennett.   |
| 2.00 S.-NE. " 18 .....                                      | 2           | 29     | 4         | Oct. 2, '14   | 23 52.0      | M. P. Bridgland. |
| 16.42 E.- " 35 .....  | 34          | 29     | 4         | Nov. 17, '14  | 25 29.6      | G. A. Bennett.   |
| At " 32 .....   | 3           | 30     | 4         | Aug. 29, '14  | 24 28.2      | M. P. Bridgland. |
| ¼ sec. cor. N. By. sec. 10 .....                            | 3           | 30     | 4         | Sept. 13, '14 | 10.6         | "                |
| At NE. cor. sec. 20 .....                                   | 3           | 30     | 4         | " 13, '14     | 02.3         | "                |
| Traverse St. J. to F.....                                   | Wabiskaw    |        |           |               |              |                  |
|   | Settlement. |        | 4         | Aug. 13, '13  | 29 34.3      | G. J. Lonergan.  |
| Cor. marked XLII, XXVIII, XXIX.                             | Fort Smith, |        |           |               |              |                  |
|   | N.W.T.      |        | 4         | July 31, '14  | 31 48.2      | S. D. Fawcett.   |
| SW. cor. bet. Lots 45 & 46 .....                            | Smith Land- |        |           |               |              |                  |
|   | ing, Alta.  |        | 4         | Aug. 3, '14   | 54.1         | "                |
| 6.41 S. of cor. between lots 51 & 52 on<br>base lines ..... | Resolution, |        |           |               |              |                  |
|   | N.W.T.      |        | 4         | July 22, '14  | 33 34.4      | "                |
| 6.41 " " " .....  | "           |        | 4         | " 22, '14     | 28.6         | "                |
| 40.00 S.-NE. cor. sec. 21 .....                             | 4           | 1      | 5         | Nov. 5, '13   | 24 36.7      | W. J. Boulton.   |
| 9.25 S.- " 20 .....   | 4           | 1      | 5         | " 7, '13      | 38.7         | "                |
| At " 23 .....   | 4           | 1      | 5         | " 8, '13      | 41.9         | "                |
| At " 21 .....   | 4           | 1      | 5         | Aug. 4, '14   | 46.8         | M. P. Bridgland. |
| At ¼ sec. cor. E. by sec. 28 .....                          | 4           | 1      | 5         | " 4, '14      | 53.6         | "                |
| At NE. cor. sec. 24 .....                                   | 4           | 1      | 5         | " 21, '14     | 42.4         | "                |
| 30.00 S.- " 11 .....  | 38          | 1      | 5         | July 24, '14  | 26 04.5      | J. M. Coté.      |
| 17.30 E.- " 32 .....  | 104         | 1      | 5         | Aug. 20, '14  | 32 09.6      | J. A. Fletcher.  |
| 1.00 W.- " 36 .....   | 104         | 1      | 5         | " 22, '14     | 31 58.6      | "                |
| At " 32 .....   | 8           | 2      | 5         | Sept. 8, '13  | 24 30.6      | W. J. Boulton.   |
| 40.00 W.- " 11 .....  | 11          | 2      | 5         | Dec. 8, '13   | 22.8         | "                |
| At " 8 .....  | 14          | 2      | 5         | Jan. 3, '14   | 22 33.5      | "                |
| At " 5 .....  | 14          | 2      | 5         | " 7, '14      | 23 40.5      | "                |
| At " 19 .....   | 15          | 2      | 5         | Aug. 5, '13   | 40.3         | "                |
| 58.81 E.- " 36 .....  | 100         | 2      | 5         | Oct. 29, '14  | 31 14.3      | J. A. Fletcher.  |
| 3.00 E.- " 34 .....   | 104         | 2      | 5         | Aug. 14, '14  | 32 02.4      | "                |
| 67.44 E.- " 36 .....  | 104         | 2      | 5         | " 18, '14     | 31 43.5      | "                |
| 53.40 W.- " 31 .....  | 112         | 2      | 5         | May 22, '14   | 30 55.9      | J. R. Akins.     |
| At ¼ sec. cor. middle N. by sec. 9. ....                    | 6           | 3      | 5         | July 2, '14   | 24 55.1      | M. Bridgland.    |
| At ¼ sec. cor. Middle N. by sec. 9. ....                    | 6           | 3      | 5         | July 2, '14   | 24 54.6      | M. P. Bridgland. |
| 0.10 S.-NE. cor. sec. 15 .....                              | 6           | 3      | 5         | " 2, '14      | 50.5         | "                |
| 7.74 S.-31.59 W.-NE. cor. sec. 20. ....                     | 8           | 3      | 5         | Oct. 22, '13  | 05.8         | W. J. Boulton.   |
| 40.00 W.-NE. cor. sec. 23 .....                             | 13          | 3      | 5         | Dec. 18, '13  | 23 45.4      | "                |
| At " 26 .....   | 14          | 3      | 5         | Aug. 27, '13  | 44.5         | "                |
| 22.00 W.- " 33 .....  | 15          | 3      | 5         | June 3, '13   | 24 15.0      | "                |
| At SE. cor. sec. 1. ....                                    | 15          | 3      | 5         | Aug. 14, '13  | 23 49.8      | "                |
| 15.00 E.- NE. cor. sec. 36 .....                            | 100         | 3      | 5         | Oct. 21, '14  | 31 08.7      | J. A. Fletcher.  |
| 23.28 E.- " 34 .....  | 104         | 3      | 5         | Aug. 8, '14   | 30 33.5      | "                |
| 27.00 W.- " 34 .....  | 112         | 3      | 5         | May 23, '14   | 31 01.6      | J. R. Akins.     |
| 12.34 W.- " 35 .....  | 112         | 3      | 5         | " 25, '14     | 30 01.5      | "                |
| At " 35 .....   | 7           | 4      | 5         | Oct. 7, '13   | 24 12.4      | W. J. Boulton.   |
| At NE. cor. T. A. McLean's Coal<br>Lease No. 3. ....        | 19          | 4      | 5         | Aug. 31, '14  | 25 02.9      | M. H. Baker.     |
| 74.16 E.-NE. cor. sec. 33 .....                             | 100         | 4      | 5         | Oct. 14, '14  | 32 15.7      | J. A. Fletcher.  |
| 56.72 E.- " 36 .....  | 104         | 4      | 5         | Aug. 5, '14   | 31 35.1      | "                |
| 1.00 W.- " 35 .....   | 112         | 4      | 5         | May 29, '14   | 32 13.1      | J. R. Akins.     |
| 56.00 W.- " 35 .....  | 112         | 4      | 5         | " 30, '14     | 49.7         | "                |
| 62.00 W.- " 35 .....  | 112         | 4      | 5         | " 31, '14     | 57.9         | "                |
| 62.00 W.- " 35 .....  | 112         | 4      | 5         | " 31, '14     | 57.6         | "                |
| 54.00 W.- " 35 .....  | 112         | 4      | 5         | " 31, '14     | 49.4         | "                |
| 54.00 W.- " 35 .....  | 112         | 4      | 5         | " 31, '14     | 50.0         | "                |
| 54.00 W.- " 35 .....  | 112         | 4      | 5         | " 31, '14     | 29.4         | "                |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                             | Township. | Range. | Meridian. | Date.         | Declination. | Observer.          |
|------------------------------------|-----------|--------|-----------|---------------|--------------|--------------------|
| 54°00 W.-NE cor. sec. 35.....      | 112       | 4      | 5         | May 31, '14   | 23 0         | J. R. Akins.       |
| 54°00 W.-" 35.....                 | 112       | 4      | 5         | " 31, '14     | 42 0         | "                  |
| 54°00 W.-" 35.....                 | 112       | 4      | 5         | " 31, '14     | 48 4         | "                  |
| 54°00 W.-" 35.....                 | 112       | 4      | 5         | " 31, '14     | 37 8         | "                  |
| 54°00 W.-" 35.....                 | 112       | 4      | 5         | " 31, '14     | 27 8         | "                  |
| 54°00 W.-" 35.....                 | 112       | 4      | 5         | " 31, '14     | 53 4         | "                  |
| 54°00 W.-" 35.....                 | 112       | 4      | 5         | " 31, '14     | 02 4         | "                  |
| 6°00 W.-" 10.....                  | 8         | 5      | 5         | Sept. 15, '13 | 24 20 1      | W. J. Boulton.     |
| 4°00 E.-" 15.....                  | 8         | 5      | 5         | " 24, '13     | 06 5         | "                  |
| 11°96 E.-" 31.....                 | 100       | 5      | 5         | Oct. 5, '14   | 30 43 6      | J. A. Fletcher.    |
| 15°00 N.-" 32.....                 | 76        | 6      | 5         | Aug. 28, '13  | 28 53 6      | G. J. Lonergan.    |
| 35°92 E.-" 36.....                 | 100       | 6      | 5         | Oct. 3, '14   | 30 16 5      | J. A. Fletcher.    |
| 9°27 E.-" 36.....                  | 104       | 6      | 5         | July 27, '14  | 31 11 1      | "                  |
| 2°00 W.-" 34.....                  | 112       | 6      | 5         | June 13, '14  | 17 4         | J. R. Akins.       |
| 44°67 W.-" 33.....                 | 112       | 6      | 5         | " 15, '14     | 32 29 5      | "                  |
| 20°00 S.-" 36.....                 | 75        | 7      | 5         | Sept. 5, '13  | 29 14 6      | G. J. Lonergan.    |
| At " 27.....                       | 75        | 7      | 5         | " 5, '13      | 35 0         | "                  |
| 30°18 E.-" 31.....                 | 100       | 7      | 5         | " 21, '14     | 31 52 3      | J. A. Fletcher.    |
| 45°00 W.-" 36.....                 | 112       | 7      | 5         | June 13, '14  | 33 23 6      | J. R. Akins.       |
| 78°73 W.-" 32.....                 | 112       | 7      | 5         | " 20, '14     | 34 47 8      | "                  |
| 5°00 W.-" 16.....                  | 35        | 8      | 5         | Sept. 19, '14 | 26 39 6      | T. D. Green.       |
| 1°00 S.-" 2.....                   | 36        | 8      | 5         | June 20, '14  | 26 7         | "                  |
| 3°00 S.-" 12.....                  | 36        | 8      | 5         | July 8, '14   | 18 8         | "                  |
| 12°00 N.-" 21.....                 | 36        | 8      | 5         | " 16, '14     | 25 4         | "                  |
| 9°50 E.-¼ cor. N. by sec. 36.....  | 75        | 8      | 5         | Sept. 4, '13  | 29 46 5      | G. J. Lonergan.    |
| 0°27 W.-NE cor. sec. 34.....       | 104       | 8      | 5         | July 8, '14   | 31 32 2      | J. A. Fletcher.    |
| 36°90 E.-" 36.....                 | 104       | 8      | 5         | " 10, '14     | 33 2         | "                  |
| 4°00 N.-" 36.....                  | 35        | 9      | 5         | Sept. 1, '14  | 26 27 9      | T. D. Green.       |
| At " 25.....                       | 73        | 9      | 5         | Oct. 23, '13  | 29 41 2      | G. J. Lonergan.    |
| 49°80 E.-" 34.....                 | 100       | 9      | 5         | Sept. 9, '14  | 34 5         | J. A. Fletcher.    |
| 64°68 W.-" 34.....                 | 112       | 9      | 5         | June 29, '14  | 33 31 0      | J. R. Akins.       |
| 10°00 S.-" 27.....                 | 40        | 10     | 5         | Oct. 22, '14  | 27 38 4      | T. D. Green.       |
| 30°00 S.-" 4.....                  | 40        | 10     | 5         | Nov. 20, '14  | 29 6         | "                  |
| 20°00 E.-" 9.....                  | 78        | 10     | 5         | Sept. 18, '14 | 29 36 9      | P. R. A. Belanger. |
| 13°55 E.-" 33.....                 | 100       | 10     | 5         | June 13, '14  | 30 52 7      | J. A. Fletcher.    |
| 64°40 W.-" 34.....                 | 112       | 10     | 5         | July 3, '14   | 36 11 3      | J. R. Akins.       |
| 60°00 W.-" 32.....                 | 112       | 10     | 5         | " 4, '14      | 35 6         | "                  |
| 12°00 N.-" 5.....                  | 26        | 11     | 5         | " 20, '14     | 25 57 1      | C. M. Walker.      |
| 5°00 N.-" 19.....                  | 26        | 11     | 5         | Oct. 10, '14  | 26 29 2      | "                  |
| 23°00 N.-" 36.....                 | 39        | 11     | 5         | Dec. 2, '14   | 27 20 5      | T. D. Green.       |
| 10°00 N.-" 25.....                 | 40        | 11     | 5         | Nov. 7, '14   | 26 2         | "                  |
| 30°00 S.-" 16.....                 | 72        | 11     | 5         | Sept. 1, '14  | 29 10 9      | P. R. A. Belanger. |
| 17°18 N.-" 8.....                  | 73        | 11     | 5         | Aug. 31, '14  | 11 5         | "                  |
| At " 11.....                       | 75        | 11     | 5         | Dec. 15, '14  | 28 7         | "                  |
| 12°00 N.-" 20.....                 | 80        | 11     | 5         | May 1, '14    | 26 4         | "                  |
| 38°00 S.-" 28.....                 | 80        | 11     | 5         | " 4, '14      | 58 1         | "                  |
| 20°00 S.-" 27.....                 | 80        | 11     | 5         | " 14, '14     | 30 06 5      | "                  |
| 39°70 E.-" 34.....                 | 100       | 11     | 5         | June 10, '14  | 30 29 0      | J. A. Fletcher.    |
| 32°37 W.-" 36.....                 | 112       | 11     | 5         | July 7, '14   | 36 25 4      | J. R. Akins.       |
| 17°00 W.-" 34.....                 | 112       | 11     | 5         | " 8, '14      | 21 6         | "                  |
| 55°52 W.-" 32.....                 | 112       | 11     | 5         | " 10, '14     | 35 47 5      | "                  |
| 68°75 W.-" 31.....                 | 112       | 11     | 5         | " 11, '14     | 45 3         | "                  |
| 20°00 N.-¼ cor. N. by sec. 23..... | 25        | 12     | 5         | " 24, '14     | 26 05 1      | C. M. Walker.      |
| At NE cor. sec. 12.....            | 26        | 12     | 5         | Oct. 19, '14  | 08 3         | "                  |
| 2°00 S.-" 31.....                  | 73        | 12     | 5         | Sept. 10, '14 | 30 33 8      | P. R. A. Belanger  |
| 1°60 N.-" 12.....                  | 80        | 12     | 5         | June 11, '14  | 29 46 4      | "                  |
| 30°90 E.-" 31.....                 | 100       | 12     | 5         | " 2, '14      | 31 11 1      | J. A. Fletcher.    |
| 34°24 W.-" 35.....                 | 112       | 12     | 5         | July 13, '14  | 35 31 4      | J. R. Akins.       |
| At " 21.....                       | 60        | 13     | 5         | Oct. 26, '13  | 28 32 9      | Jas. Gibbon        |
| 26°70 E.-" 31.....                 | 100       | 13     | 5         | May 28, '14   | 31 14 8      | J. A. Fletcher.    |
| 32°31 E.-" 34.....                 | 100       | 13     | 5         | " 30, '14     | 41 0         | "                  |
| 27°03 E.-" 36.....                 | 100       | 13     | 5         | June 1, '14   | 36 2         | "                  |
| 0°55 W.-" 31.....                  | 112       | 13     | 5         | July 23, '14  | 35 06 9      | J. R. Akins.       |
| 41°00 N.-" 25.....                 | 77        | 14     | 5         | Aug. 9, '14   | 29 54 3      | P. R. A. Belanger. |



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place.  | Township. | Range. | Meridian. | Date.         | Declination. | Observer.          |
|---|-----------|--------|-----------|---------------|--------------|--------------------|
| 28° 98' W.-. N. E. cor. sec. 31.....                  | 100       | 14     | 5         | May 21, '14   | 32 02.5      | J. A. Fletcher.    |
| 49° 70' W.-. " 33.....                                | 112       | 14     | 5         | July 26, '14  | 34 03.9      | J. R. Akins.       |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 33 58.6      | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 34 02.1      | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 33 59.6      | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 57.2         | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 56.8         | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 55.0         | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 49.4         | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 33 46.3      | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 51.6         | "                  |
| " " 33.....   | 112       | 14     | 5         | " 26, '14     | 59.2         | "                  |
| 60° 00' S.-. " 36.....                                | 60        | 15     | 5         | Sept. 22, '13 | 29 50.5      | G. J. Lonergan.    |
| 3° 00' N.-. " 14.....                                 | 73        | 15     | 5         | Aug. 26, '14  | 00.9         | P. R. A. Belanger. |
| At " 33.....  | 78        | 15     | 5         | " 17, '14     | 06.8         | "                  |
| 7° 50' E.-. " 1.....                                  | 100       | 15     | 5         | May 16, '14   | 32 15.2      | J. A. Fletcher.    |
| 50° 10' E.-. " 32.....                                | 100       | 15     | 5         | " 18, '14     | 28.5         | "                  |
| 32° 60' W.-. " 33.....                                | 112       | 15     | 5         | Aug. 1, '14   | 33 09.1      | J. R. Akins.       |
| " " 33.....   | 112       | 15     | 5         | " 1, '14      | 19.8         | "                  |
| " " 33.....   | 112       | 15     | 5         | " 2, '14      | 22.2         | "                  |
| 31° 00' W.-. " 33.....                                | 112       | 15     | 5         | " 2, '14      | 13.7         | "                  |
| 2° 00' E.-. " 19.....                                 | 49        | 16     | 5         | Oct. 26, '14  | 27 39.5      | H. Matheson.       |
| 4° 00' E.-. " 32.....                                 | 100       | 16     | 5         | May 11, '14   | 33 14.8      | J. A. Fletcher.    |
| 65° 42' W.-. " 35.....                                | 112       | 16     | 5         | Aug. 4, '14   | 42.4         | J. R. Akins.       |
| 53° 92' W.-. " 34.....                                | 112       | 16     | 5         | " 5, '14      | 49.6         | "                  |
| 6° 00' N.-. " 29.....                                 | 47        | 17     | 5         | Sept. 2, '13  | 27 04.7      | H. Matheson.       |
| 15° 00' E.-. " 19.....                                | 47        | 17     | 5         | " 9, '13      | 04.8         | "                  |
| 20° 00' E.-. " 19.....                                | 48        | 17     | 5         | Aug. 1, '13   | 28 12.4      | "                  |
| 8° 00' S.-. " 17.....                                 | 48        | 17     | 5         | " 2, '13      | 27 27.9      | "                  |
| 20° 00' S.-. " 5.....                                 | 48        | 17     | 5         | " 6, '13      | 14.6         | "                  |
| 41° 00' S.-. " 5.....                                 | 48        | 17     | 5         | " 7, '13      | 25.3         | "                  |
| 3° 40' E.-. " 31.....                                 | 100       | 17     | 5         | May 4, '14    | 32 23.9      | J. A. Fletcher.    |
| 13° 80' W.-. " 34.....                                | 100       | 17     | 5         | " 6, '14      | 33 36.2      | "                  |
| 0° 80' W.-. " 36.....                                 | 100       | 17     | 5         | " 8, '14      | 41.7         | "                  |
| 21° 30' W.-. " 33.....                                | 112       | 17     | 5         | Aug. 10, '14  | 37 10.4      | J. R. Akins.       |
| " " 33.....   | 112       | 17     | 5         | " 10, '14     | 02.9         | "                  |
| " " 33.....   | 112       | 17     | 5         | " 10, '14     | 36 57.2      | "                  |
| 21° 60' W.-. " 32.....                                | 112       | 17     | 5         | " 11, '14     | 27 03.4      | "                  |
| 42° 21' S.-. " 20.....                                | 23        | 18     | 5         | Oct. 6, '14   | 25 58.2      | N. C. Stewart.     |
| At Sta. 629 Traverse, Columbia river,<br>sec. 15..... | 23        | 18     | 5         | " 9, '14      | 57.9         | "                  |
| At Station 7, Road from Field to Hector               | 28        | 18     | 5         | July 16, '14  | 26 04.2      | M. H. Baker.       |
| At NE cor. Field Cemetery.....                        | 28        | 18     | 5         | " 25, '14     | 16.4         | "                  |
| At Station 4, Survey of Lot for Geo.<br>Lawes.....    | 28        | 18     | 5         | Aug. 4, '14   | 05.8         | "                  |
| At T. H. 74 Road from Field out Yoho<br>Valley.....   | 29        | 18     | 5         | June 29, '14  | 05.2         | "                  |
| At T. H. 96, Road from Field out Yoho<br>Valley.....  | 29        | 18     | 5         | July 1, '14   | 20.7         | "                  |
| At T. H. 143, Road from Field out Yoho<br>Valley..... | 29        | 18     | 5         | " 9, '14      | 04.2         | "                  |
| 2° 80' E.-NE cor. sec. 24.....                        | 47        | 18     | 5         | Aug. 29, '13  | 28 56.2      | H. Matheson.       |
| 35° 00' N.-. " 24.....                                | 48        | 18     | 5         | " 15, '13     | 27 38.2      | "                  |
| 23° 50' S.-. " 1.....                                 | 48        | 18     | 5         | " 19, '13     | 07.7         | "                  |
| 20° 00' N.-. " 10.....                                | 77        | 18     | 5         | Sept. 23, '14 | 29 11.1      | P. R. A. Belanger. |
| 27° 55' W.-. " 35.....                                | 112       | 18     | 5         | Aug. 14, '14  | 36 37.1      | J. R. Akins.       |
| 26° 90' W.-. " 32.....                                | 112       | 18     | 5         | " 17, '14     | 07.5         | "                  |
| 46° 11' W.-. " 31.....                                | 112       | 18     | 5         | " 20, '14     | 35 55.3      | "                  |
| 60° 00' E.-. " 31.....                                | 23        | 19     | 5         | " 21, '14     | 25 52.9      | N. C. Stewart.     |
| 60° 00' E.-. " 32.....                                | 23        | 19     | 5         | " 22, '14     | 52.3         | "                  |
| 8° 00' E.-. " 34.....                                 | 23        | 19     | 5         | Sept. 1, '14  | 54.7         | "                  |
| 5° 00' E.-. " 34.....                                 | 23        | 19     | 5         | " 1, '14      | 55.9         | "                  |
| 5° 00' E.-. " 34.....                                 | 23        | 19     | 5         | " 2, '14      | 55.9         | "                  |
| 28° 00' E.-. " 33.....                                | 23        | 19     | 5         | " 2, '14      | 56.0         | "                  |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.  | Township. | Range. | Meridian. | Date.        | Declination. | Observer.          |
|---|-----------|--------|-----------|--------------|--------------|--------------------|
| 2°00 E.-NE cor. sec. 33                         | 23        | 19     | 5         | Sept. 2, '14 | 53°0         | N. C. Stewart.     |
| 7°00 S.-  | 23        | 19     | 5         | " 4, '14     | 55°7         | "                  |
| 60°00 S.-                                       | 23        | 19     | 5         | " 4, '14     | 59°2         | "                  |
| 2°50 E.-  | 23        | 19     | 5         | " 4, '14     | 52°7         | "                  |
| At  | 23        | 19     | 5         | " 8, '14     | 49°9         | "                  |
| 55°00 S.-                                       | 23        | 19     | 5         | " 10, '14    | 59°4         | "                  |
| 5°00 E.-  | 23        | 19     | 5         | " 12, '14    | 43°1         | "                  |
| 20°00 E.-SE $\frac{1}{2}$ sec. 30               | 23        | 19     | 5         | " 14, '14    | 56°3         | "                  |
| At NE cor. sec. 36                              | 23        | 19     | 5         | " 23, '14    | 53°8         | "                  |
| At T. H. 15 Road from Field, B.C. to<br>Orbital | 27        | 19     | 5         | June 22, '14 | 26 09°4      | M. H. Baker.       |
| 50°00 N.-NE cor. sec. 27                        | 73        | 19     | 5         | Nov. 14, '14 | 29 24°5      | P. R. A. Belanger. |
| At NE cor. sec. 23                              | 71        | 19     | 5         | " 11, '14    | 27°8         | "                  |
| 2°00 S.-NE cor. sec. 23                         | 76        | 19     | 5         | Oct. 3, '14  | 20°8         | "                  |
| 79°12 W.  | 112       | 19     | 5         | Aug. 22, '14 | 35 13°5      | J. R. Akins.       |
| 2°25 W.   | 112       | 19     | 5         | " 25, '14    | 19°9         | "                  |
| At  | 23        | 20     | 5         | " 19, '14    | 25 53°9      | N. C. Stewart.     |
| 16°00 W.-                                       | 23        | 20     | 5         | " 20, '14    | 57°1         | "                  |
| 3°00 E.-  | 24        | 20     | 5         | July 4, '14  | 54°9         | "                  |
| 22°80 E.-                                       | 24        | 20     | 5         | " 7, '14     | 50°6         | "                  |
| 18°40 E.-                                       | 24        | 20     | 5         | " 8, '14     | 54°0         | "                  |
| 69°00 E.-                                       | 24        | 20     | 5         | " 9, '14     | 53°0         | "                  |
| At  | 24        | 20     | 5         | " 13, '14    | 55°5         | "                  |
| 60°00 W.-                                       | 24        | 20     | 5         | " 14, '14    | 59°4         | "                  |
| 16°00 E.-                                       | 24        | 20     | 5         | " 15, '14    | 51°9         | "                  |
| 70°00 E.-                                       | 24        | 20     | 5         | " 16, '14    | 58°6         | "                  |
| 71°00 S.-                                       | 24        | 20     | 5         | " 17, '14    | 55°5         | "                  |
| 63°00 S.-                                       | 24        | 20     | 5         | " 18, '14    | 52°7         | "                  |
| 14°00 S.-                                       | 25        | 20     | 5         | June 30, '14 | 54°5         | "                  |
| 70°00 E.-                                       | 25        | 20     | 5         | July 2, '14  | 53°0         | "                  |
| 55°00 S.-                                       | 25        | 20     | 5         | " 6, '14     | 56°6         | "                  |
| At Station 826 Traverse, Columbia R.,<br>sec. 8 | 25        | 20     | 5         | Oct. 19, '14 | 59°4         | "                  |
| 47°00 N.-NE cor. sec. 3                         | 78        | 20     | 5         | " 1, '14     | 29 40°5      | P. R. A. Belanger. |
| 17°31 W.-                                       | 112       | 20     | 5         | Aug. 31, '14 | 34 22°2      | J. R. Akins.       |
| At  | 25        | 21     | 5         | June 8, '14  | 26 10°0      | N. C. Stewart.     |
| 20°00 N.-                                       | 25        | 21     | 5         | " 12, '14    | 25 56°5      | "                  |
| 5°38 N.-  | 25        | 21     | 5         | " 15, '14    | 51°8         | "                  |
| Course 12-13 Traverse, Columbia R.,<br>sec. 33  | 25        | 21     | 5         | " 22, '14    | 49°5         | "                  |
| 55°00 N.-NE cor. sec. 30                        | 26        | 21     | 5         | May 11, '14  | 26 08°0      | "                  |
| At  | 26        | 21     | 5         | June 2, '14  | 25 49°1      | "                  |
| 76°00 W.  | 26        | 21     | 5         | " 3, '14     | 55°6         | "                  |
| At  | 26        | 21     | 5         | May 14, '14  | 26 01°2      | "                  |
| 32°00 N.-SE cor. sec 7                          | 26        | 21     | 5         | June 4, '14  | 25 53°3      | N. C. Stewart.     |
| 5°00 N.-NE "                                    | 26        | 21     | 5         | " 5, '14     | 52°2         | "                  |
| At T.H. 31 Traverse Columbia R. sec.<br>8       | 26        | 21     | 5         | " 8, '14     | 53°5         | "                  |
| 32°00 N.-NE cor. sec. 16                        | 73        | 21     | 5         | Nov. 19, '14 | 29 23°7      | P. R. A. Belanger. |
| 8°00 S.-  | 79        | 21     | 5         | Oct. 30, '14 | 25°6         | "                  |
| 22°00 E.-                                       | 79        | 21     | 5         | Nov. 2, '14  | 37°0         | "                  |
| 35°00 S.-NE "                                   | 80        | 21     | 5         | Oct. 28, '14 | 16°9         | "                  |
| 11°45 W.-                                       | 112       | 21     | 5         | Sept. 2, '14 | 33 57°2      | J. R. Akins.       |
| 30°00 E.-                                       | 26        | 22     | 5         | May 18, '14  | 26 06°9      | N. C. Stewart.     |
| 15°00 S.-                                       | 26        | 22     | 5         | " 23, '14    | 00°8         | "                  |
| 60°00 S.-                                       | 26        | 22     | 5         | " 25, '14    | 06°2         | "                  |
| At T.H. 34, sec. 13                             | 27        | 22     | 5         | Apr. 27, '14 | 11°5         | "                  |
| 7°00 E.-NE cor. sec. 11                         | 27        | 22     | 5         | " 29, '14    | 20°1         | "                  |
| 7°23 E.-  | 27        | 22     | 5         | May 7, '14   | 14°6         | "                  |
| 45°00 W.-                                       | 78        | 22     | 5         | Oct. 19, '14 | 29 27°9      | P. R. A. Belanger. |
| 25°00 N.-                                       | 80        | 22     | 5         | " 21, '14    | 29 19°0      | "                  |
| 34°00 W.-                                       | 112       | 22     | 5         | Sept 9, '14  | 33 09°5      | J. R. Akins.       |
| 67°99 W.-                                       | 112       | 22     | 5         | " 11, '14    | 13°9         | "                  |
| 15°00 N.-                                       | 73        | 23     | 5         | Nov. 26, '14 | 29 21°5      | P. R. A. Belanger. |







RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                          | Township. | Range. | Meridian. | Date.         | Declination. | Observer.      |
|---------------------------------|-----------|--------|-----------|---------------|--------------|----------------|
| 69° 77' W.-NE. cor. sec. 32.    | 23        | 18     | 6         | June 16, '14  | 27 16.6      | C. H. Taggart. |
| 69° 77' W.-" 32                 | 23        | 18     | 6         | " 17, '14     | 19.8         | "              |
| 33° 25' W.-" 31                 | 23        | 18     | 6         | " 18, '14     | 24 05.9      | "              |
| At " 31                         | 23        | 18     | 6         | " 19, '14     | 46.4         | "              |
| 65° 00' N.-" 12                 | 81        | 18     | 6         | Sept. 28, '13 | 30 39.8      | L. Brenot.     |
| 20° 00' S.-" 26                 | 82        | 18     | 6         | " 10, '14     | 31 29.3      | "              |
| 10° 00' S.-" 26                 | 82        | 18     | 6         | " 27, '14     | 05.5         | "              |
| 30° 00' N.-" 12                 | 83        | 18     | 6         | Aug. 8, '13   | 12.1         | "              |
| 60° 00' E.-SE " 2               | 83        | 18     | 6         | Sept. 26, '14 | 21.4         | "              |
| 21° 00' W.-NE " 1               | 24        | 19     | 6         | June 20, '14  | 26 13.9      | C. H. Taggart. |
| 11° 93' N.-¼ cor. sec. 1        | 24        | 19     | 6         | " 20, '14     | 26.3         | "              |
| 23° 00' W.-NE. cor. sec. 17     | 24        | 19     | 6         | July 8, '14   | 27 07.4      | "              |
| 19° 00' W.-¼ cor. N. by sec. 18 | 24        | 19     | 6         | " 9, '14      | 25 43.7      | "              |
| 15° 00' W.-NE. cor. sec. 17     | 24        | 19     | 6         | " 29, '14     | 26 34.3      | "              |
| 25° 00' N.-" 12                 | 81        | 19     | 6         | Sept. 10, '13 | 31 17.6      | L. Brenot.     |
| 60° 00' N.-" 25                 | 81        | 19     | 6         | " 20, '13     | 16.6         | "              |
| 60° 00' S.-NE " 30              | 22        | 20     | 6         | Oct. 21, '14  | 27 02.7      | J. A. Calder.  |
| 51° 00' E.-" 6                  | 23        | 20     | 6         | " 17, '14     | 26 44.6      | "              |
| 1° 00' W.-" 5                   | 23        | 20     | 6         | " 19, '14     | 27 05.8      | "              |
| 3° 00' E. ¼ post sec. 13        | 24        | 20     | 6         | July 10, '14  | 26 53.3      | C. H. Taggart. |
| At ¼ post N. by sec. 15         | 24        | 20     | 6         | " 26, '14     | 47.0         | "              |
| At " " 15                       | 24        | 20     | 6         | " 26, '14     | 47.2         | "              |
| At NE. cor. sec. 14             | 24        | 20     | 6         | " 29, '14     | 16.6         | "              |
| 38° 00' N.-" 21                 | 83        | 20     | 6         | " 30, '13     | 30 55.0      | L. Brenot.     |
| 5° 00' E.-" 36                  | 22        | 21     | 6         | Oct. 16, '14  | 27 00.6      | J. A. Calder.  |
| 1° 00' E.-" 24                  | 22        | 21     | 6         | " 22, '14     | 30 19.4      | "              |
| 17° 00' S. ¼ on N. by sec. 36   | 22        | 21     | 6         | " 23, '14     | 28 47.7      | "              |
| 1° 00' E.-NE. cor. sec. 24      | 22        | 21     | 6         | " 24, '14     | 30 24.8      | "              |
| 13° 35' W.-" 33                 | 23        | 21     | 6         | Aug. 13, '14  | 26 30.3      | C. H. Taggart. |
| 10° 26' W.-¼ post N. by sec. 32 | 23        | 21     | 6         | " 15, '14     | 27 34.2      | "              |
| 30° 00' N.-NE. cor. sec. 32     | 23        | 21     | 6         | " 17, '14     | 26 46.7      | "              |
| 26° 70' S. ¼ post E. by sec. 33 | 23        | 21     | 6         | " 18, '14     | 22.7         | "              |
| 26° 70' " " 33                  | 23        | 21     | 6         | " 19, '14     | 30.9         | "              |
| At NE. cor. sec. 34             | 23        | 21     | 6         | " 20, '14     | 47.5         | "              |
| 22° 50' N.-" 3                  | 24        | 21     | 6         | " 3, '14      | 47.4         | "              |
| 19° 74' W.-" 10                 | 24        | 21     | 6         | " 8, '14      | 48.5         | "              |
| 21° 46' W. ¼ N. by sec. 18      | 24        | 21     | 6         | " 31, '14     | 05.1         | "              |
| 43° 00' N.-NE. cor. sec. 3      | 84        | 21     | 6         | July 25, '13  | 31 02.1      | L. Brenot.     |
| At ¼ post N. by sec. 14         | 24        | 22     | 6         | Sept. 2, '14  | 26.15.1      | C. H. Taggart. |
| 6° 00' N.-NE. cor. sec. 22      | 24        | 22     | 6         | " 2, '14      | 25 44.2      | "              |
| *4° 00' E.-" 21                 | 24        | 22     | 6         | " 5, '14      | 51.8         | "              |
| 37° 80' W.-" 21                 | 24        | 22     | 6         | " 7, '14      | 23 18.6      | "              |
| 6° 00' W. ¼ N. by sec. 21       | 24        | 22     | 6         | " 9, '14      | 26 30.6      | "              |
| 40° 10' W.-" 20                 | 24        | 22     | 6         | " 10, '14     | 34.8         | "              |
| 19° 00' W.-" 19                 | 24        | 22     | 6         | " 12, '14     | 24 57.4      | "              |
| 40° 00' E.-NE. cor. sec. 19     | 83        | 22     | 6         | July 20, '13  | 31 44.5      | L. Brenot.     |
| 5° 00' S.-¼ N. by sec. 7        | 7         | 23     | 6         | Oct. 6, '14   | 24 58.4      | Jas. Gibbon.   |
| At " 17                         | 7         | 23     | 6         | " 10, '14     | 25 22.0      | "              |
| At " 20                         | 7         | 23     | 6         | " 12, '14     | 23.8         | "              |
| At ¼ E. " 29                    | 7         | 23     | 6         | " 14, '14     | 14.1         | "              |
| At " " 28                       | 7         | 23     | 6         | " 15, '14     | 18.3         | "              |
| 74° 00' W.-NE. cor. sec. 22     | 13        | 23     | 6         | " 6, '14      | 48.7         | W. H. Norrish. |
| 15° 00' S.-" 29                 | 13        | 23     | 6         | " 7, '14      | 24 57.6      | "              |
| 65° 00' W.-" 21                 | 13        | 23     | 6         | " 7, '14      | 22 06.8      | "              |
| 25° 00' W.-" 22                 | 14        | 23     | 6         | Aug. 11, '14  | 28 35.7      | "              |
| 46° 94' W.-" 33                 | 14        | 23     | 6         | Sept. 1, '14  | 25 51.6      | "              |
| 46° 03' W.-" 32                 | 14        | 23     | 6         | " 3, '14      | 27.5         | "              |
| 41° 00' N.-" 4                  | 14        | 23     | 6         | Oct. 12, '14  | 28 48.7      | "              |
| 9° 00' W.-" 3                   | 14        | 23     | 6         | " 19, '14     | 23 22.8      | "              |
| At " 4                          | 14        | 23     | 6         | " 20, '14     | 30 23.7      | "              |
| 77° 00' S.-" 10                 | 15        | 23     | 6         | Aug. 5, '14   | 24 44.4      | "              |
| 9° 76' S.-" 8                   | 15        | 23     | 6         | " 28, '14     | 25 00.6      | "              |
| *45° 00' W.-" 5                 | 15        | 23     | 6         | Sept. 5, '14  | 24 23.8      | "              |
| 71° 44' N.-SE. " 6              | 15        | 23     | 6         | " 21, '14     | 26 26.2      | "              |



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

| Place.  | Township. | Range. | Meridian. | Date.         | Declination | Observer.      |
|---|-----------|--------|-----------|---------------|-------------|----------------|
| 45°00 N.- NE. cor. sec. 7.....                      | 15        | 23     | 6         | Sept. 24, '14 | 25 20.3     | W. H. Norrish. |
| 54°00 W.- SE. " 6.....                              | 15        | 22     | 6         | " 29, '14     | 24 31.6     | "              |
| 8°00 W.- NE. " 22.....                              | 24        | 23     | 6         | " 15, '14     | 27 40.6     | C. H. Taggart. |
| 21°50 W.- " 21.....                                 | 24        | 23     | 6         | " 17, '14     | 26 45.2     | "              |
| 19°82 W.- $\frac{1}{4}$ post N. by sec. 20.....     | 24        | 23     | 6         | " 19, '14     | 25 55.3     | "              |
| *At $\frac{1}{4}$ E by sec. 21.....                 | 6         | 24     | 6         | " 5, '14      | 04.3        | Jas. Gibbon.   |
| 75°00 N. $\frac{1}{4}$ post N. by sec. 22.....      | 6         | 24     | 6         | " 12, '14     | 11.6        | "              |
| 38°00 N.- NE. cor. sec. 27.....                     | 6         | 24     | 6         | " 25, '14     | 02.1        | "              |
| At $\frac{1}{4}$ N. by sec. 35.....                 | 6         | 24     | 6         | " 29, '14     | 13.8        | "              |
| 50°00 N.- SE. cor. sec. 1.....                      | 15        | 24     | 6         | " 30, '14     | 26 17.2     | W. H. Norrish. |
| 5°00 N.- " 4.....                                   | 16        | 24     | 6         | Oct. 28, '14  | 29.4        | "              |
| 25°17 N.- NE. cor sec. 4.....                       | 16        | 24     | 6         | " 29, '14     | 24.1        | "              |
| 43°00 S.- " 8.....                                  | 18        | 24     | 6         | Sept. 10, '14 | 07.3        | J. A. Calder.  |
| 2°00 E.- " 9.....                                   | 18        | 24     | 6         | " 12, '14     | 28 07.3     | "              |
| 40°00 S.- " 4.....                                  | 18        | 24     | 6         | " 15, '14     | 27 47.3     | "              |
| 20°00 E.- " 16.....                                 | 18        | 24     | 6         | " 19, '14     | 25 16.2     | "              |
| 24°00 E.- " 15.....                                 | 18        | 24     | 6         | " 22, '14     | 36.7        | "              |
| 10°00 E.- NW. cor. L.S. 12, sec. 24....             | 18        | 24     | 6         | " 28, '14     | 57.7        | "              |
| 24°00 S.- NE. cor. sec. 27.....                     | 18        | 24     | 6         | " 29, '14     | 49.6        | "              |
| 15°00 N.- " 27.....                                 | 19        | 24     | 6         | Oct. 3, '14   | 47.7        | "              |
| 60°00 W.- " 22.....                                 | 19        | 24     | 6         | " 5, '14      | 27 23.3     | "              |
| 10°00 W.- " 15.....                                 | 19        | 24     | 6         | " 6, '14      | 28 22.9     | "              |
| 19°18 W.- 2°00 S.- $\frac{1}{4}$ N. by-sec. 34      | 19        | 24     | 6         | " 8, '14      | 27 31.2     | "              |
| 2°50 E.- NE. cor. sec. 4.....                       | 20        | 24     | 6         | " 10, '14     | 28 24.4     | "              |
| 45°00 W.- " 9.....                                  | 24        | 24     | 6         | Sept 28, '14  | 15.0        | C. H. Taggart. |
| 45°00 W.- " 9.....                                  | 24        | 24     | 6         | " 29, '14     | 11.9        | "              |
| 5°00 N.- " 36.....                                  | 80        | 24     | 6         | Apr. 4, '14   | 31 40.7     | L. Brenot.     |
| 30°00 N.- " 25.....                                 | 80        | 24     | 6         | " 3, '14      | 45.7        | "              |
| 7°09 N.- " 24.....                                  | 81        | 24     | 6         | " 8, '14      | 57.3        | "              |
| 30°00 N.- " 1.....                                  | 82        | 24     | 6         | " 19, '14     | 56.7        | "              |
| 40°00 N.- " 1.....                                  | 84        | 24     | 6         | July 23, '14  | 31.6        | "              |
| 22°00 E. " 7.....                                   | 5         | 25     | 6         | May 13, '14   | 23 47.9     | Jas. Gibbon.   |
| 20°00 N.- " 8.....                                  | 5         | 25     | 6         | " 15, '14     | 24 51.7     | "              |
| 64°70 N.- " 8.....                                  | 5         | 25     | 6         | " 16, '14     | 53.8        | "              |
| 16°62 S.- " 8.....                                  | 5         | 25     | 6         | " 17, '14     | 28.4        | "              |
| 16°62 S.- " 8.....                                  | 5         | 25     | 6         | " 19, '14     | 25 08.0     | "              |
| 25°00 N.- " 17.....                                 | 5         | 25     | 6         | " 29, '14     | 24 51.6     | "              |
| 7°00 E.- " 20.....                                  | 5         | 25     | 6         | " 30, '14     | 25 11.0     | "              |
| 31°35 N.- " 21.....                                 | 5         | 25     | 6         | June 3, '14   | 31.5        | "              |
| 55°00 N.- " 20.....                                 | 5         | 25     | 6         | " 10, '14     | 26.9        | "              |
| 18°83 E.- " 17.....                                 | 5         | 25     | 6         | " 22, '14     | 22.1        | "              |
| 21°35 E.- " 20.....                                 | 5         | 25     | 6         | " 22, '14     | 44.9        | "              |
| 18°83 E.- " 17.....                                 | 5         | 25     | 6         | " 23, '14     | 19.2        | "              |
| 66°00 E.- " 17.....                                 | 5         | 25     | 6         | " 23, '14     | 16.3        | "              |
| 40°00 N.- " 16.....                                 | 5         | 25     | 6         | " 25, '14     | 12.0        | "              |
| 25°00 S.- " 16.....                                 | 5         | 25     | 6         | " 27, '14     | 26.7        | "              |
| 17°20 E.- $\frac{1}{4}$ cor. E. by-sec. 8.....      | 5         | 25     | 6         | July 1, '14   | 24 18.4     | "              |
| 8°00 W.- $\frac{1}{4}$ cor. E. by. sec. 17.....     | 5         | 25     | 6         | " 2, '14      | 24 46.3     | "              |
| 53°00 W.- NE. cor. sec. 28.....                     | 5         | 25     | 6         | " 6, '14      | 25 37.1     | "              |
| 30°00 N.- " 28.....                                 | 5         | 25     | 6         | " 13, '14     | 26 13.8     | "              |
| 16°50 N.- " 34.....                                 | 5         | 25     | 6         | " 18, '14     | 27 06.6     | "              |
| 61°34 N.- $\frac{1}{4}$ cor. N. by sec. 35.....     | 5         | 25     | 6         | " 28, '14     | 57.5        | "              |
| 28°52 N.- NE. cor. sec. 11.....                     | 3         | 25     | 6         | Aug 4, '14    | 24 48.6     | "              |
| 27°36 N.- $\frac{1}{4}$ cor. N. by. sec. 13.....    | 6         | 25     | 6         | " 13, '14     | 57.7        | "              |
| 27°36 N.- $\frac{1}{4}$ " 13.....                   | 6         | 25     | 6         | " 13, '14     | 25 00.1     | "              |
| 48°92 N.- $\frac{1}{4}$ " 13.....                   | 6         | 25     | 6         | " 16, '14     | 11.3        | "              |
| 48°92 N.- $\frac{1}{4}$ " 13.....                   | 6         | 25     | 6         | " 16, '14     | 08.3        | "              |
| At NE. cor. sec. 24.....                            | 6         | 25     | 6         | " 17, '14     | 06.0        | "              |
| 3°00 S. centre sec. 3.....                          | 17        | 25     | 6         | Apr. 28, '14  | 26 09.7     | J. A. Calder.  |
| 1°93 N. 6°93 W.- $\frac{1}{4}$ cor. E. by. sec. 3.. | 18        | 25     | 6         | May 6, '14    | 19.5        | "              |
| 16°00 N.- SE. cor. sec. 4.....                      | 18        | 25     | 6         | " 8, '14      | 25 21.0     | "              |
| 6°00 N.- " 3.....                                   | 18        | 26     | 6         | " 12, '14     | 49.3        | "              |
| 40°00 W.- NE " 30.....                              | 18        | 25     | 6         | " 27, '14     | 26 47.9     | "              |
| 29°90 S. 15°00 E.- centre of sec. 16..              | 18        | 25     | 6         | " 28, '14     | 34.6        | "              |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

| Place.                                   | Township. | Range. | Meridian. | Date.        | Declination. | Observer.      |
|--|-----------|--------|-----------|--------------|--------------|----------------|
| 28°55' S. 14°30' W.-NE. cor. sec. 20...  | 18        | 25     | 6         | May 29, '14  | 25 48.0      | J. A. Calder.  |
| 41°70' E. 48°62' N.-" 30.....            | 18        | 25     | 6         | " 30, '14    | 26 42.4      | "              |
| 33°30' E. 8°50' S.-" 8. ....             | 18        | 25     | 6         | June 3, '14  | 51.0         | "              |
| At NE. cor. sec. 31.....                 | 18        | 25     | 6         | " 10, '14    | 59.6         | "              |
| 68°00' S. ¼ cor. N. by sec. 16.....      | 18        | 25     | 6         | " 12, '14    | 54.3         | "              |
| 48°00' W.-NE. cor. sec. 23 ....          | 18        | 25     | 6         | " 23, '14    | 33.2         | "              |
| At NW. cor. lot 17, G. 1..               | 18        | 25     | 6         | " 27, '14    | 30.2         | "              |
| 25°00' E.,SW. cor. lot 18, G. 1.....     | 18        | 25     | 6         | " 26, '14    | 04.5         | "              |
| 15°50' E.-NW. " 17, G. 1..               | 18        | 25     | 6         | " 28, '14    | 37.6         | "              |
| 15°50' E.-" 17, G. 1.....                | 18        | 25     | 6         | " 29, '14    | 36.8         | "              |
| 15°50' E.-" 17, G. 1.....                | 18        | 25     | 6         | July 4, '14  | 29.4         | "              |
| At NE. cor. sec. 34 .....                | 23        | 25     | 6         | Oct. 8, '14  | 04.9         | C. H. Taggart. |
| 12°00' W.-" 34 .....                     | 23        | 25     | 6         | " 9, '14     | 09.9         | "              |
| 34°50' E.-SW. cor. lot 42.....           | 23        | 25     | 6         | " 17, '14    | 27 17.8      | "              |
| 1°70' N.-NE. cor. sec. 18.....           | 23        | 25     | 6         | " 26, '14    | 04.5         | "              |
| 30°24' S.-NE. cor. sec. 3.....           | 24        | 25     | 6         | " 7, '14     | 26 54.6      | "              |
| 30°24' S.-" 3.....                       | 24        | 25     | 6         | " 8, '14     | 58.4         | "              |
| 25°00' N. ¼ cor. E. by sec. 21 ....      | 5         | 26     | 6         | " 22, '14    | 25 29.3      | Jas. Gibbon.   |
| 20°00' W.-NE. cor. sec. 21.....          | 5         | 26     | 6         | " 23, '14    | 25.0         | "              |
| 54°00' S.-" 14 .....                     | 11        | 26     | 6         | Apr. 29, '14 | 57.2         | W. H. Norrish. |
| 24°00' S.-" 11 .....                     | 11        | 26     | 6         | " 30, '14    | 26 00.4      | "              |
| 51°00' S.-" 11.....                      | 11        | 26     | 6         | May 1, '14   | 25 52.2      | "              |
| 4°50' S.-" 2.....                        | 11        | 26     | 6         | " 2, '14     | 48.4         | "              |
| 30°00' S.-" 2.....                       | 11        | 26     | 6         | " 4, '14     | 48.7         | "              |
| 23°00' N.-" 14.....                      | 11        | 26     | 6         | " 12, '14    | 53.9         | "              |
| 55°00' N.-" 14.....                      | 11        | 26     | 6         | " 13, '14    | 26 02.4      | "              |
| 11°00' W.-" 23 .....                     | 11        | 26     | 6         | " 14, '14    | 25 58.1      | "              |
| 46°00' W.-" 23.....                      | 11        | 26     | 6         | " 15, '14    | 55.3         | "              |
| 46°00' W.-" 23 .....                     | 11        | 26     | 6         | " 16, '14    | 54.6         | "              |
| 61°00' W.-" 23 .....                     | 11        | 26     | 6         | " 16, '14    | 26 00.8      | "              |
| 34°00' E.-" 33.....                      | 11        | 26     | 6         | " 20, '14    | 25 48.8      | "              |
| 43°60' S.-" 34.....                      | 11        | 26     | 6         | " 22, '14    | 47.4         | "              |
| 70°00' S.-" 34 .....                     | 11        | 26     | 6         | " 23, '14    | 53.6         | "              |
| 21°20' S.-" 27.....                      | 11        | 26     | 6         | " 26, '14    | 26 09.2      | "              |
| 50°00' N.-SE. " 3 .....                  | 12        | 26     | 6         | " 29, '14    | 03.7         | "              |
| 50°00' N.-NE. " 3.....                   | 12        | 26     | 6         | " 30, '14    | 02.6         | "              |
| 30°00' W.-" 10.....                      | 12        | 26     | 6         | June 3, '14  | 07.9         | "              |
| 56°00' W.-" 10 .....                     | 12        | 26     | 6         | " 4, '14     | 25 55.6      | "              |
| 3°00' S.-" 9 .....                       | 12        | 26     | 6         | " 9, '14     | 26 01.0      | "              |
| 30°00' S.-" 9.....                       | 12        | 26     | 6         | " 10, '14    | 00.3         | "              |
| 22°50' N.-SE. " 4.....                   | 12        | 26     | 6         | " 11, '14    | 25 42.3      | "              |
| 32°50' N. NE. " 9 .....                  | 12        | 26     | 6         | " 22, '14    | 59.1         | "              |
| 60°00' W.-" 16 .....                     | 12        | 26     | 6         | " 25, '14    | 59.6         | "              |
| 22°00' N.-" 5.....                       | 12        | 26     | 6         | July 6, '14  | 26 12.7      | "              |
| 33°40' S.-NW. " 19 .....                 | 12        | 26     | 6         | " 10, '14    | 25 53.3      | "              |
| 95°00' N.-SE. cor. Lytton, I.R. No. 15   | 16        | 26     | 6         | " 10, '14    | 28 14.4      | J. A. Calder.  |
| 45°10' N.-NE. cor. sec. 19 .....         | 16        | 26     | 6         | " 14, '14    | 26 13.1      | "              |
| 65°00' N.-NE. cor. sec. 19 .....         | 16        | 26     | 6         | " 16, '14    | 26 58.5      | "              |
| 23°00' S.-¼ cor. N. by sec. 34.....      | 16        | 26     | 6         | " 25, '14    | 27 01.7      | "              |
| 180°70' N.-SW. cor. Lytton, I.R. No. 15. | 17        | 26     | 6         | Aug. 1, '14  | 25 57.9      | "              |
| 55°00' S.-NE. cor. sec. 18 .....         | 3         | 28     | 6         | " 18, '14    | 24 34.3      | P. McIlhenny.  |
| At NE.-SW. ¼ sec. 12.....                | 4         | 29     | 6         | July 24, '14 | 25.3         | "              |
| At NE.-NW. ¼ sec. 12.....                | 4         | 29     | 6         | " 25, '14    | 44.3         | "              |
| 64°38' E.-NE. cor. sec. 15.....          | 4         | 29     | 6         | " 31, '14    | 26 09.4      | "              |
| 56°11' N.-NW. " 17 .....                 | 3         | 30     | 6         | June 14, '14 | 23 41.2      | "              |
| 12°60' S. 15°00' W. NW. cor. sec. 20 ..  | 3         | 30     | 6         | " 17, '14    | 43.6         | "              |
| 13°52' W. 18°88' N.-NE. 20 .....         | 3         | 30     | 6         | " 30, '14    | 22.1         | "              |
| 15°72' S.-NE. cor. sec. 24.....          | 3         | 30     | 6         | Aug. 21, '14 | 24 25.3      | "              |
| 32°52' N.-" 14 .....                     | 3         | 30     | 6         | " 27, '14    | 23 14.2      | "              |
| 25°00' S.-" 15 .....                     | 3         | 30     | 6         | Oct. 27, '14 | 21 44.7      | "              |
| 63°77' N.-" 15 .....                     | 3         | 30     | 6         | Sept. 4, '14 | 22 42.4      | "              |
| 29°54' N.-" 11.....                      | 3         | 30     | 6         | " 15, '14    | 23 44.1      | "              |
| At SE. cor. lot 8.....                   | Wrigley,  |        |           |              |              |                |
|  | N.W.T.    |        |           | Aug. 11, '15 | 40 24.1      | S. D. Fawcett. |



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations—Concluded.

| Place.                                     | Township.  | Range. | Meridian. | Date.         | Declination. | Observer.      |
|--|------------|--------|-----------|---------------|--------------|----------------|
|  | Wrigley,   |        |           |               | °   '   "    |                |
| 2°00 S.-cor. bet. lots 4 & 5 on base line. | N.W.T.     |        |           | July 15, '14  | 39 37 2      | S. D. Fawcett. |
| At I.P. Pits at E. end of N, by lot 5...   | Simpson.   |        |           |               |              |                |
|  | N.W.T.     |        |           | July 27, '13  | 37 32·8      |                |
| At NE. cor. lot 38 .....                   | "          |        |           | June 24, '14  | 32·6         | "              |
| At   "   38.....                           | "          |        |           | " 28, '14     | 34·6         | "              |
| At   "   38.....                           | "          |        |           | " 28, '14     | 32 2         | "              |
| 7°60 N. 6°00 W.-¼ cor. N. by sec. 18..     | 5   4   7  |        |           | June 8, '14   | 25 43·2      | P. Melhuish.   |
| At west I.P. Pits N. by lot 7.....         | Good Hope, |        |           |               |              |                |
|  | N.W.T.     |        |           | Sept. 16, '13 | 42 04 1      | S. D. Fawcett. |
| At   "   "   8 .....                       | "          |        |           | " 16, '13     | 40 57·2      | "              |
| At   "   "   .....                         | "          |        |           | " 17, '13     | 41 01 4      | "              |
| At   "   "   7 .....                       | "          |        |           | " 17, '13     | 40 8         | "              |
| At   "   "   .....                         | "          |        |           | " 17, '13     | 36·9         | "              |
| At SW. cor. lot 7....                      | Norman,    |        |           |               |              |                |
|  | N.W.T.     |        |           | Nov. 15, '13  | 40 21 5      | "              |
| At cor. bet. Lots 9 & 10 on base line...   | "          |        |           | July 9, '14   | 40 54·7      | "              |
| At   "   "   "   "   .....                 | "          |        |           | " 12, '14     | 41·7         | "              |
| 75°00 S.-¼ cor. N. by sec. 35.....         | 39         |        | C         | Oct. 9, '14   | 24 01·2      | P. Melhuish.   |
| 75°00   "   "   26.....                    | 39         |        | C         | " 14, '14     | 23 29·4      | "              |
| 39°00   "   "   35.....                    | 39         |        | C         | " 15, '14     | 24 11·6      | "              |
| 37°65 E.-NE. cor. sec. 34.....             | 39         |        | C         | Sept. 25, '14 | 26 03 0      | "              |
| 38°50 S. 11°10 E.-NE. cor. sec. 23.....    | Frac.tp.39 |        | C         | May 27, '14   | 43 7         | "              |
| 9°20 S. 21°00 W.-   "   24.....            | " 39       |        | C         | " 28, '14     | 24 24·6      | "              |
| 21°00 S. 18°50 W.-   "   24.....           | " 39       |        | C         | " 29, '14     | 26 12 9      | "              |
| 38°00 S.-   "   "   23.....                | " 39       |        | C         | " 30, '14     | 23 00 4      | "              |



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15—Concluded.

TABLE II.—Inclination and Total Intensity.

| Station.<br>Distance in chains from<br>nearest post. | Township. | Range. | Meridian. | Date.         | Inclination. |         | Total Intensity. |                   | Observer.         | Instrument. |
|--|-----------|--------|-----------|---------------|--------------|---------|------------------|-------------------|-------------------|-------------|
|  |           |        |           |               | L. M. T.     | Value.  | L. M. T.         | Value.            |                   |             |
| 10 00 E. 20 00 S.-N.E. cor. sec. 33.....             | 14        | 2      | Pr.       | July 22, '14  | 8 7-9 8      | 78 10 7 | 9 1-9 5          | C.G.S.<br>0 62920 | E. J. Wight...    | T.S. 62.    |
| 10 00 E. 20 00 S.-" " " " " "                        | 14        | 2      | "         | " 22, '14     | 9 5-10 5     | 78 10 8 | 9 8-10 2         | 0 62919           | "                 | "           |
| 10 00 E. 20 00 S.-" " " " " "                        | 14        | 2      | "         | " 22, '14     | 10 2-11 2    | 78 10 9 | 10 5-10 9        | 0 62920           | "                 | "           |
| 5 00 E. 30 00 S.-" " " " " "                         | 14        | 2      | "         | Nov. 6, '14   | 9 3-10 5     | 78 10 6 | 9 8-10 2         | 0 62906           | "                 | "           |
| 5 00 E. 30 00 S.-" " " " " "                         | 14        | 2      | "         | " 6, '14      | 10 1-11 3    | 78 10 3 | 10 5-10 9        | 0 62993           | "                 | "           |
| 5 00 E. 30 00 S.-" " " " " "                         | 14        | 2      | "         | " 6, '14      | 10 9-12 1    | 78 10 2 | 11 3-11 8        | 0 62994           | "                 | "           |
| 1 00 W.-N.E. cor. sec. 28.....                       | 14        | 2      | "         | July 18, '14  | 13 6-15 3    | 78 08 9 | 14 2-14 7        | 0 62899           | R. C. Purser..... | "           |
| 1 00 W.-" " " " " "                                  | 14        | 2      | "         | " 18, '14     | 14 6-16 2    | 78 08 8 | 15 3-15 7        | 0 62947           | "                 | "           |
| 1 00 W.-" " " " " "                                  | 14        | 2      | "         | " 18, '14     | 15 7-17 1    | 78 08 8 | 16 2-16 6        | 0 62939           | "                 | "           |
| 1 00 W.-" " " " " "                                  | 14        | 2      | "         | Nov. 10, '14  | 10 0-11 5    | 78 10 3 | 10 6-11 1        | 0 62913           | "                 | "           |
| 1 00 W.-" " " " " "                                  | 14        | 2      | "         | " 10, '14     | 11 1-12 5    | 78 10 0 | 11 6-12 0        | 0 62876           | "                 | "           |
| 1 00 W.-" " " " " "                                  | 14        | 2      | "         | " 10, '14     | 12 1-13 3    | 78 09 1 | 12 5-13 0        | 0 62952           | "                 | "           |
| 15 00 E. 27 00 N.-N.E. cor. sec. 28.....             | 9         | 27     | "         | July 26, '14  | 9 0-10 1     | 77 12 9 | 9 4-9 8          | 0 62573           | E. J. Wight.....  | "           |
| 15 00 E. 27 00 N.-" " " " " "                        | 9         | 27     | "         | " 26, '14     | 9 8-10 9     | 77 12 7 | 10 1-10 4        | 0 62574           | "                 | "           |
| 15 00 E. 27 00 N.-" " " " " "                        | 9         | 27     | "         | " 26, '14     | 10 4-11 5    | 77 12 8 | 10 8-11 2        | 0 62579           | "                 | "           |
| 20 00 W. 30 00 N.-" " " " " "                        | 21        | 31     | "         | June 24, '14  | 9 2-10 1     | 78 02 0 | 9 5-9 9          | 0 63267           | "                 | "           |
| 20 00 W. 30 00 N.-" " " " " "                        | 21        | 31     | "         | " 24, '14     | 9 9-10 7     | 78 02 1 | 10 1-10 5        | 0 63267           | "                 | "           |
| 20 00 W. 30 00 N.-" " " " " "                        | 21        | 31     | "         | " 24, '14     | 10 5-11 4    | 78 02 1 | 10 7-11 1        | 0 63270           | "                 | "           |
| 25 00 E. 8 00 S.-N.E. cor. sec. 3.....               | 28        | 17     | " 2       | June 27, '14  | 14 2-15 3    | 77 47 1 | 14 6-14 9        | 0 62962           | "                 | "           |
| 26 00 E. 8 00 S.-" " " " " "                         | 28        | 17     | " 2       | " 27, '14     | 14 9-16 0    | 77 47 3 | 15 3-15 6        | 0 62966           | "                 | "           |
| 26 00 E. 8 00 S.-" " " " " "                         | 28        | 17     | " 2       | " 27, '14     | 15 6-16 6    | 77 47 5 | 15 9-16 3        | 0 62969           | "                 | "           |
| 9 00 S. 12 00 E.-" " " " " "                         | 25        | 17     | " 2       | July 1, '14   | 7 2-8 3      | 77 40 2 | 7 6-7 9          | 0 62770           | "                 | "           |
| 9 00 S. 12 00 E.-" " " " " "                         | 25        | 17     | " 2       | " 1, '14      | 7 9-8 9      | 77 40 1 | 8 3-8 6          | 0 62771           | "                 | "           |
| 9 00 S. 12 00 E.-" " " " " "                         | 25        | 17     | " 2       | " 1, '14      | 8 6-9 6      | 77 40 2 | 8 9-9 3          | 0 62779           | "                 | "           |
| 35 00 S. 4 00 W.-" " " " " "                         | 23        | 19     | " 2       | Oct. 29, '14  | 10 3-11 4    | 77 28 1 | 10 7-11 0        | 0 62616           | "                 | "           |
| 35 00 S. 4 00 W.-" " " " " "                         | 23        | 19     | " 2       | " 29, '14     | 11 0-12 1    | 77 28 1 | 11 4-11 8        | 0 62617           | "                 | "           |
| 35 00 S. 4 00 W.-" " " " " "                         | 23        | 19     | " 2       | " 29, '14     | 11 8-12 9    | 77 28 0 | 12 1-12 5        | 0 62607           | "                 | "           |
| 35 00 S. 4 00 W.-" " " " " "                         | 23        | 19     | " 2       | " 29, '14     | 13 0-14 6    | 77 27 2 | 13 6-14 0        | 0 62650           | "                 | "           |
| 20 00 N. 25 00 W.-" " " " " "                        | 29        | 13     | " 3       | Sept. 10, '14 | 13 6-14 6    | 77 01 7 | 14 0-14 4        | 0 62599           | "                 | "           |
| 20 00 N. 25 00 W.-" " " " " "                        | 29        | 13     | " 3       | " 10, '14     | 14 4-15 2    | 77 01 7 | 14 6-14 9        | 0 62600           | "                 | "           |
| 20 00 N. 25 00 W.-" " " " " "                        | 29        | 13     | " 3       | " 10, '14     | 14 9-16 0    | 77 01 5 | 15 2-15 6        | 0 62604           | "                 | "           |
| 2 00 S. 0 20 E.-" " " " " "                          | 39        | 13     | " 3       | Sept. 25, '14 | 9 2-10 3     | 77 42 0 | 9 6-10 0         | 0 62703           | "                 | "           |
| 2 00 S. 0 20 E.-" " " " " "                          | 39        | 13     | " 3       | " 25, '14     | 10 0-11 0    | 77 42 1 | 10 3-10 6        | 0 62700           | "                 | "           |
| 2 00 S. 0 20 E.-" " " " " "                          | 39        | 13     | " 3       | " 25, '14     | 10 6-11 7    | 77 42 0 | 11 0-11 3        | 0 62709           | "                 | "           |
| 9 00 N. 1 50 E.-" " " " " "                          | 19        | 15     | " 3       | Oct. 13, '14  | 13 5-14 6    | 76 35 1 | 13 9-14 2        | 0 61840           | "                 | "           |
| 9 00 N. 1 50 E.-" " " " " "                          | 19        | 15     | " 3       | " 13, '14     | 14 2-15 3    | 76 35 1 | 14 6-15 0        | 0 61833           | "                 | "           |
| 9 00 N. 1 50 E.-" " " " " "                          | 19        | 15     | " 3       | " 13, '14     | 15 0-16 1    | 76 35 1 | 15 3-15 7        | 0 61820           | "                 | "           |



## SESSIONAL PAPER No. 26b

|       |    |       |     |   |    |    |    |   |       |         |           |         |           |         |  |  |  |
|-------|----|-------|-----|---|----|----|----|---|-------|---------|-----------|---------|-----------|---------|--|--|--|
| 20 00 | N. | 5 00  | E.- | " | 19 | 24 | 15 | 3 | Sept. | 2, '14  | 9 2-10 4  | 76 35 2 | 9 6-10 0  | 0 62247 |  |  |  |
| 20 00 | S. | 5 00  | E.- | " | 19 | 24 | 15 | 3 | "     | 2, '14  | 10 1-11 1 | 76 35 2 | 10 4-10 7 | 0 62251 |  |  |  |
| 20 00 | S. | 5 00  | E.- | " | 19 | 24 | 15 | 3 | "     | 2, '14  | 10 7-11 7 | 76 35 3 | 11 1-11 4 | 0 62246 |  |  |  |
| 7 00  | N. | 5 00  | E.- | " | 23 | 36 | 20 | 3 | Aug.  | 10, '14 | 8 1-9 2   | 77 22 2 | 8 5-8 8   | 0 62253 |  |  |  |
| 7 00  | N. | 5 00  | E.- | " | 23 | 36 | 20 | 3 | "     | 10, '14 | 8 8-9 8   | 77 22 8 | 9 2-9 5   | 0 62274 |  |  |  |
| 7 00  | N. | 5 00  | E.- | " | 28 | 36 | 20 | 3 | "     | 10, '14 | 9 5-10 5  | 77 23 6 | 9 8-10 2  | 0 62264 |  |  |  |
| 4 00  | E. | 29 00 | N.- | " | 33 | 47 | 20 | 3 | Oct.  | 1, '14  | 13 5-14 7 | 78 03 6 | 13 9-14 3 | 0 62481 |  |  |  |
| 4 00  | E. | 29 00 | N.- | " | 33 | 47 | 20 | 3 | "     | 1, '14  | 14 3-15 3 | 78 03 2 | 14 6-15 0 | 0 62476 |  |  |  |
| 4 00  | E. | 29 00 | N.- | " | 33 | 47 | 20 | 3 | "     | 1, '14  | 15 0-16 1 | 78 03 4 | 15 3-15 7 | 0 62464 |  |  |  |







SESSIONAL PAPER No. 25b

## APPENDIX No. 64.

## Surveying Instruments on Hand, March 31, 1915.

| Instruments.                             | In Stock<br>April 1,<br>1914. | Purchased<br>1914-1915. | Sold<br>1914-1915. | Balance on hand,<br>March 31, 1915. |           | Remarks.                    |
|--|-------------------------------|-------------------------|--------------------|-------------------------------------|-----------|-----------------------------|
|  |                               |                         |                    | On loan.                            | In store. |                             |
| Abney levels. ....                       | 52                            |                         | 10                 | 4                                   | 38        |                             |
| Alidades. ....                           |                               | 1                       |                    |                                     | 1         |                             |
| Alt-azimuths. ....                       | 1                             |                         |                    |                                     | 1         |                             |
| Aneroids. ....                           | 102                           |                         | 8                  | 4                                   | 90        |                             |
| Artificial Horizons. ....                | 4                             |                         |                    |                                     | 4         |                             |
| Base line apparatus. ....                | 1                             |                         |                    |                                     | 1         |                             |
| Cameras and Kodaks. ....                 | 17                            | 2                       |                    | 1                                   | 14        | One destroyed in bush fire. |
| Compasses. ....                          | 34                            |                         |                    |                                     | 34        |                             |
| Current meters and logs. ....            | 4                             |                         |                    |                                     | 4         |                             |
| Dip circles. ....                        | 2                             |                         |                    |                                     | 2         |                             |
| Field glasses and bino-<br>culars. ....  | 7                             |                         |                    | 3                                   | 4         |                             |
| Levels. ....                             | 38                            |                         |                    | 10                                  | 28        |                             |
| Levelling rods. ....                     | 85                            | 3                       |                    | 25                                  | 40        | 23 worn out on surveys.     |
| Micrometer telescopes. ....              | 8                             |                         |                    |                                     | 8         |                             |
| Optical squares. ....                    | 1                             |                         |                    | 1                                   |           |                             |
| Pedometers. ....                         | 2                             |                         |                    |                                     | 2         |                             |
| Photo-theodolites. ....                  | 5                             |                         |                    | 1                                   | 4         |                             |
| Plane tables. ....                       |                               | 1                       |                    |                                     | 1         |                             |
| Protractors. ....                        | 40                            |                         |                    | 1                                   | 39        |                             |
| Rod levels. ....                         | 19                            | 6                       |                    | 8                                   | 14        | Three lost on survey.       |
| Sextants and reflecting<br>circles. .... | 3                             |                         |                    |                                     | 3         |                             |
| Sidereal watches. ....                   | 66                            | 1                       | 5                  | 3                                   | 59        |                             |
| Solar compasses. ....                    | 2                             |                         |                    |                                     | 2         |                             |
| Stadia rods. ....                        | 20                            | 20                      | 18                 | 1                                   | 18        | Three worn out on survey.   |
| Stadia slide rules. ....                 | 22                            |                         | 1                  | 1                                   | 20        |                             |
| Steel tapes. ....                        | 150                           | 27                      | 38                 | 9                                   | 130       |                             |
| Subsidiary standard<br>measures. ....    | 111                           | 5                       | 14                 |                                     | 102       |                             |
| Survey pickets. ....                     | 2                             |                         |                    |                                     | 2         |                             |
| Surveying cameras. ....                  | 4                             |                         |                    |                                     | 4         |                             |
| Tally registers. ....                    | 12                            |                         |                    |                                     | 12        |                             |
| Tape stretching appa-<br>ratus. ....     |                               | 1                       |                    | 1                                   |           |                             |
| Telemeters. ....                         | 1                             |                         |                    | 1                                   |           |                             |
| Thermometers. ....                       | 17                            |                         | 1                  | 2                                   | 14        |                             |
| Transit theodolites. ....                | 51                            | 35                      | 22                 | 4                                   | 60        |                             |
| Zenith telescopes. ....                  | 1                             |                         |                    | 1                                   |           |                             |



















